United States
Department of
Agriculture

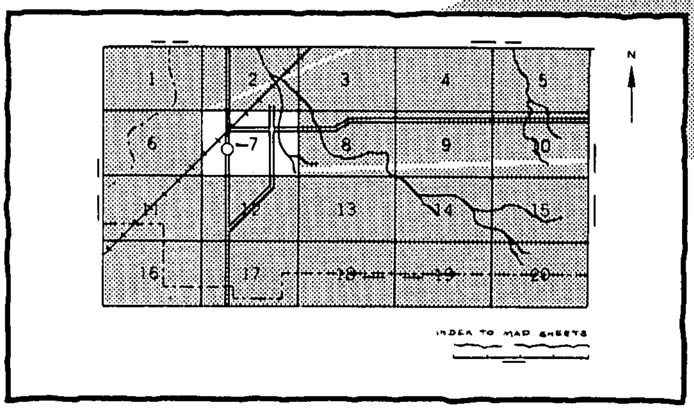
Soil
Conservation
Service

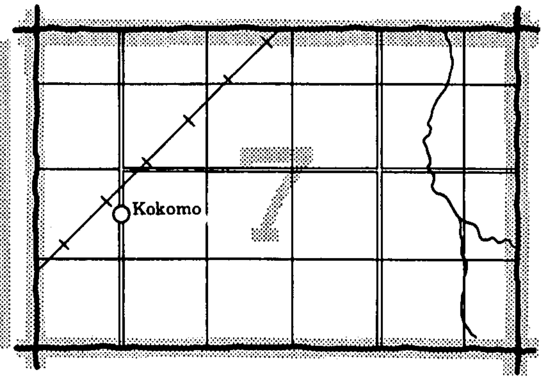
In Cooperation with
University of Florida,
Institute of Food and
Agricultural Sciences,
Agricultural Experiment
Stations and Soil Science
Department, and Florida
Department of Agriculture
and Consumer Services

Soil Survey of Manatee County Florida

HOW TO USE

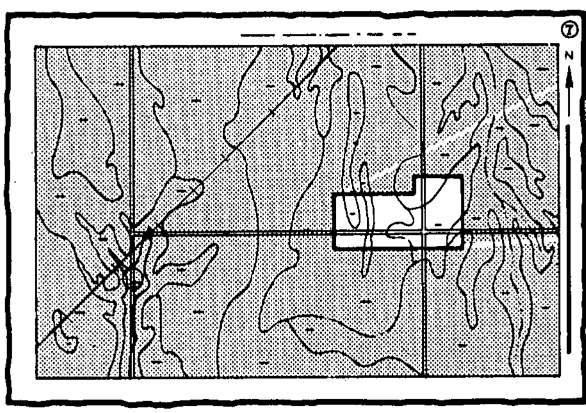
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

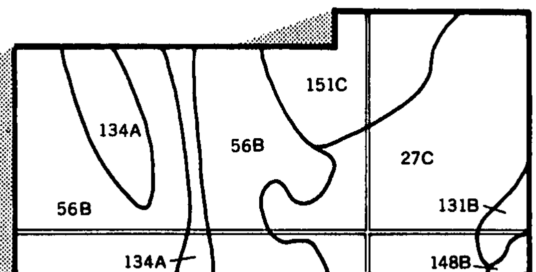




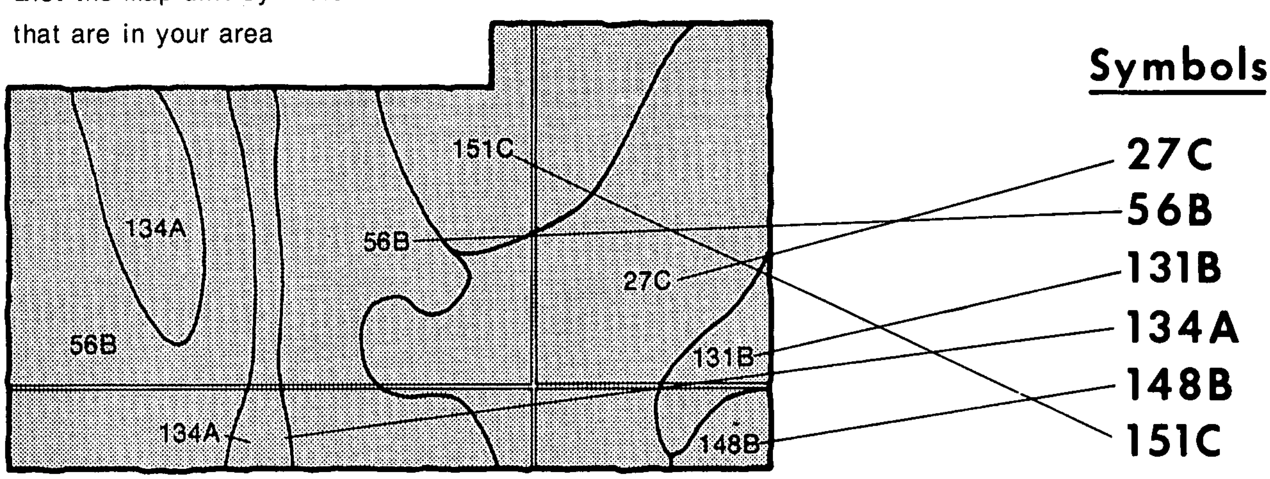
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



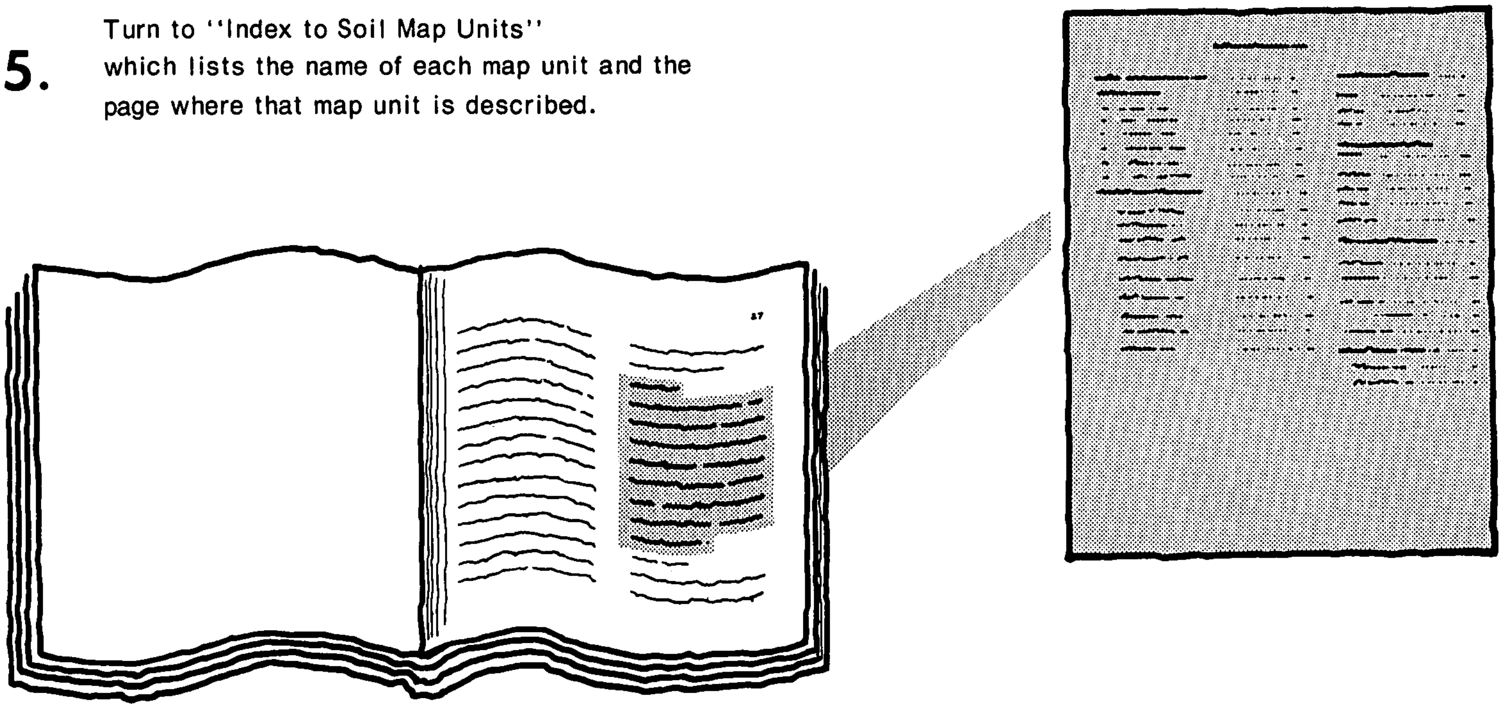


4. List the map unit symbols that are in your area

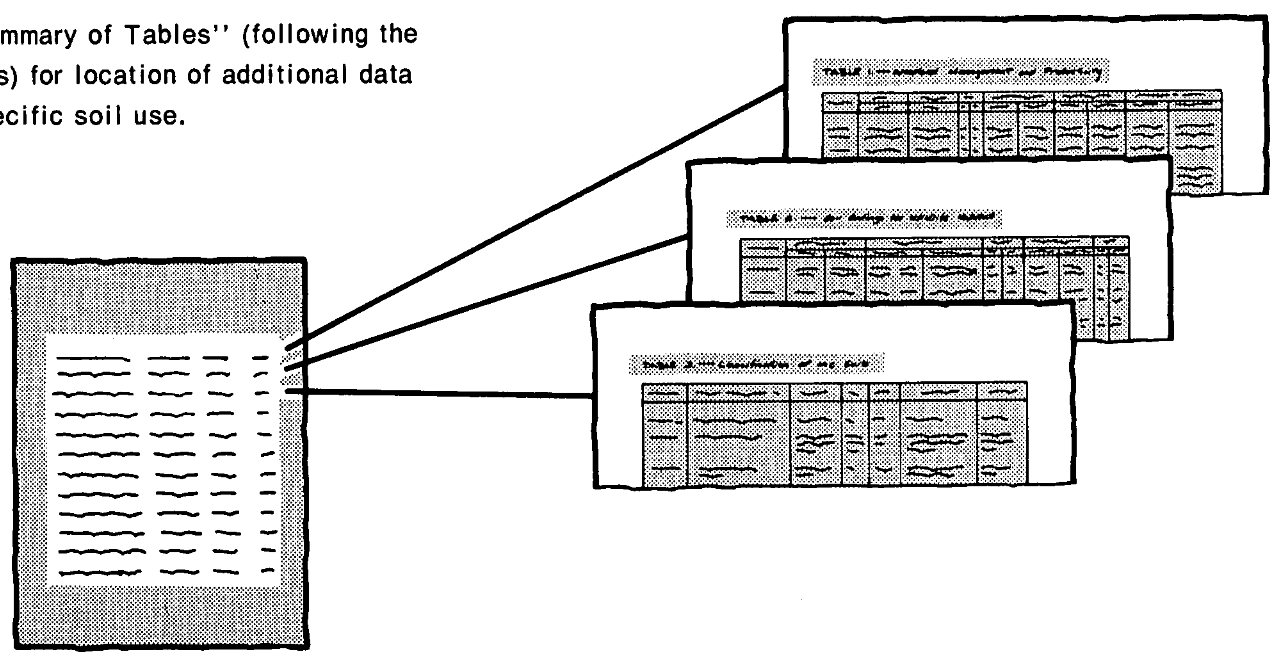


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was done prior to November 1952, when the soil survey program was administered by the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. The first soil survey of Manatee County was issued in December 1958. In 1980, the soils were recorrelated, and data were revised and updated for this soil survey. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service and the University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department, and the Florida Department of Agriculture and Consumer Services. It is part of the technical assistance furnished to the Manatee River Soil and Water Conservation District. The Manatee County Board of Commissioners contributed financially to this soil survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Many of the soils in Manatee County are used for crop production. The main crops are citrus and tomatoes.

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soil series

Issued April 1983

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foreword

This soil survey contains information that can be used in land-planning programs in Manatee County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

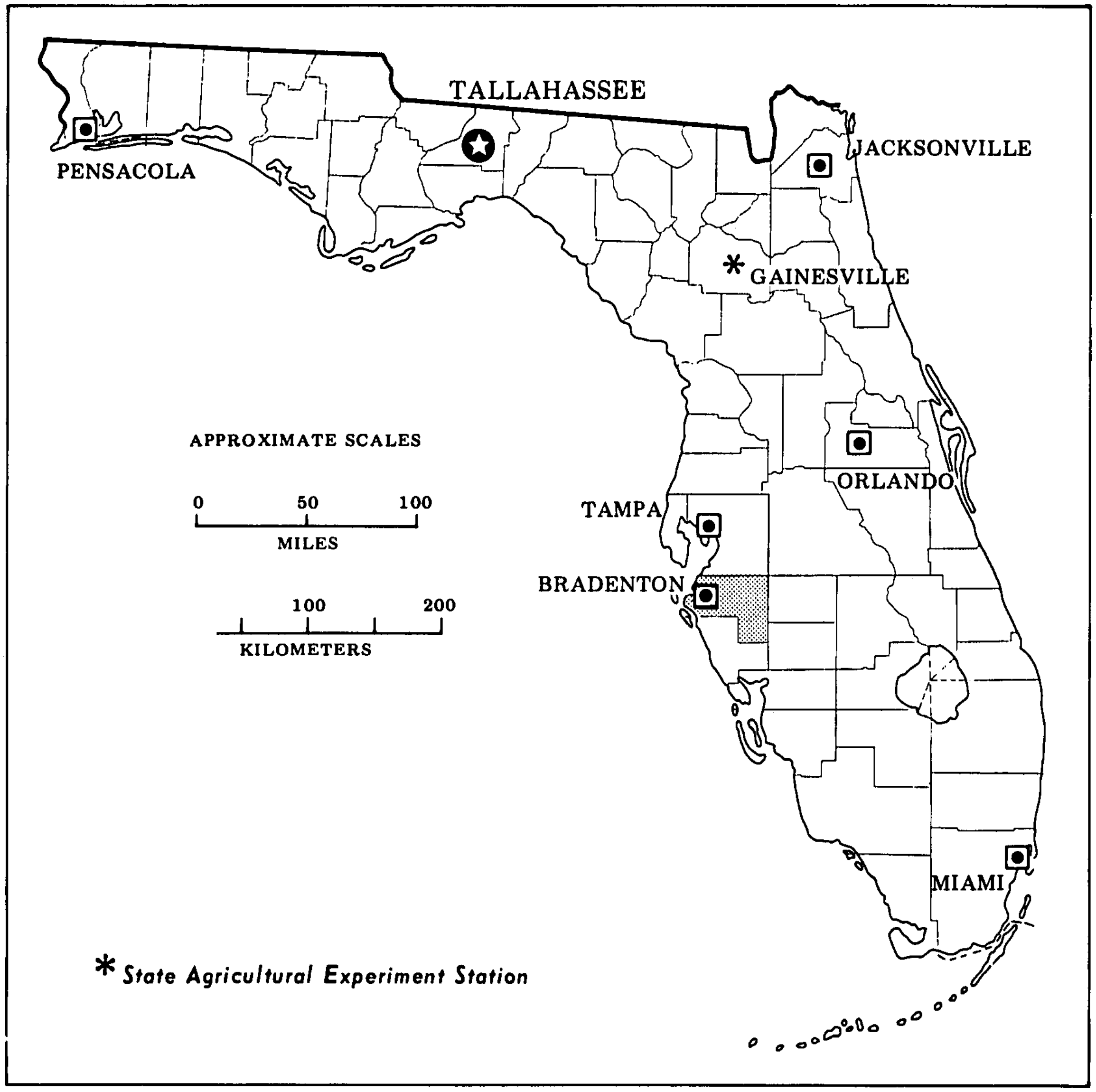
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

James W. Mitchell

James W. Mitchell
State Conservationist
Soil Conservation Service



Location of Manatee County in Florida.

soil survey of
Manatee County, Florida

By Adam G. Hyde and Horace F. Huckle, Soil Conservation Service

Soils recorrelated by Horace F. Huckle, Adam G. Hyde, and Robert W. Johnson, Soil Conservation Service

Soils surveyed by R. E. Caldwell, O. C. Olson, and J. B. Cromrite, Florida Agricultural Experiment Stations, and R. G. Leighty, Bureau of Soils, USDA

United States Department of Agriculture, Soil Conservation Service
in cooperation with
University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department, and
Florida Department of Agriculture and Consumer Services

MANATEE COUNTY is in the west-central part of the peninsula of Florida. It is bounded on the west by the Gulf of Mexico, on the north by Hillsborough County, on the east by Hardee and De Soto Counties, and on the south by Sarasota County. Bradenton is the county seat and the largest city. Manatee County has long been a thriving agricultural and tourist center. It is becoming an industrial and commercial center as well.

general nature of the county

In this section, the environmental and cultural factors that affect the use and management of soils in Manatee County are described. These factors are climate; history; physiography, relief, and drainage; water supply; population; farming; transportation; markets; and recreation.

climate

The climate of Manatee County is oceanic and subtropical. The temperature is influenced by latitude, low elevation, winds that sweep across the peninsula, and proximity to the Gulf of Mexico. The climate, consequently, is characterized by high relative humidity, short mild winters, long warm summers, and rainfall that is abundant throughout the year but is heaviest from June through September.

The climate is tempered by the Gulf of Mexico and landlocked bays, rivers, and creeks. The bodies of water protect the area from frost in winter; thus vegetables and citrus fruit can be grown.

Monthly, seasonal, and annual temperature and precipitation data are shown in table 1.

Temperatures above 95° F occur frequently in summer. Such temperatures are of short duration because thunderstorms, which usually occur in the afternoon, quickly cool the air. Temperatures fall below the freezing point once or twice a year and generally in the eastern part of the county. Frost records kept at Bradenton over a 40-year period indicate that the latest killing frost in spring occurred on March 25, and the earliest killing frost in autumn on November 18. There were 13 years with no killing frost in spring and 21 years with none in autumn.

Some areas near water are frost free the year round. The soils in these areas are suitable for growing gladiolus for bulbs and cut flowers. In addition, tomatoes, cabbage, peppers, escarole, lettuce, cucumbers, eggplant, and celery are also grown in winter and in

most years are not damaged by frost. Grazing of native grasses and of most of the improved pasture continues throughout the year. Shelter for livestock generally is not needed. During occasional cold waves, citrus groves are fired to prevent damage to trees and fruit. However, firing of the groves is seldom necessary because damaging freezes, when temperatures fall to 28° F or below, occur only once or twice every 5 to 10 years.

The seasonal distribution of rainfall is generally uniform. During periods of drought, however, which generally occur in spring, crops are irrigated to prevent damage. The average rainfall for June, July, and August during a 72-year period is 26.21 inches. The average rainfall for December, January, and February during this same period is 7.76 inches. Winter precipitation generally occurs in the form of a slow steady drizzle.

During September and early October, hurricanes are likely to form in the area of the Caribbean Sea. There is generally one severe hurricane a year, and about one in five strikes the peninsula of Florida. When a hurricane occurs, the accompanying rains damage the crops as much or more than the wind.

The mild winters in Manatee County have attracted tourists in increasing numbers. Some tourists stay to make permanent homes. Bradenton is a well-known resort. Its population during the tourist season, which runs from October through April, is about double that in summer.

history

In 1854, Dr. Joseph Braden, a pioneer sugar planter, built a house in the area that was to become Bradenton. The history of the area, however, dates to the Stone Age, relics of which are in the local museum. In 1528, the Spanish explorers began coming to the area. Hernando de Soto arrived in 1539.

Manatee County was established as the 31st county in Florida on January 9, 1855. It was divided twice to create new counties. The last time was in 1921 when Sarasota County was established. There has been a post office in Bradenton since 1878.

The county takes its name from the manatee, a sea cow that formerly inhabited the waters in large numbers but recently has become scarce. The manatee has been declared an endangered species and accorded special protection.

physiography, relief, and drainage

Manatee County lies within the Floridian section of the Coastal Plain province (*5*). The natural topographic divisions in Florida are (1) the Central Highlands, (2) the Tallahassee Hills, (3) the Marianna Lowlands, (4) the Western Highlands, and (5) the Coastal Lowlands (*4*). Manatee County consists almost entirely of Coastal Lowlands. The Coastal Lowlands are made up mainly of nearly level plains that have emerged so recently from the sea that large areas have undergone little or no dissection. Invasions of the sea in the Pleistocene epoch have left successive shorelines at about 100, 70, 42, and 25 feet above present sea level. The marine terraces corresponding to the shorelines have been named, respectively, the Wicomico, Penhaloway, Talbot, and Pamlico terraces.

Most areas of the county are level. Some areas in the central and northeastern parts are gently rolling. Elevations range from slightly lower than 150 feet in the northeastern tip to sea level along the gulf coast.

Manatee County has a fairly extensive drainage system. The headwaters of the Manatee River are in the northeastern part of the county. The river flows southwesterly for several miles and then approximately westerly into the Gulf of Mexico. It is joined by the Braden River just east of Bradenton. The Little Manatee River also originates in the northeastern part of the county, but it flows northwesterly and enters Hillsborough County. The Myakka River originates in the far eastern part of the county and flows southwesterly through Myakka City and the Myakka River State Park into Sarasota County. Numerous streams flow into each of these rivers. An extensive network of canals drains some of the low areas.

water supply

The city of Bradenton receives its water supply from Ward Lake, a reservoir with a filtration plant on the Braden River. A large part of Manatee County and some areas in Sarasota County receive their water supply from a 2,000-acre reservoir on the Manatee River. In other areas in Manatee County, wells are the principal source of water.

Water for livestock is plentiful in the many ponds, streams, canals, and rivers. Windmills and pumped wells are used in some areas, and dugouts or waterholes are used on suitable sites. Flow from artesian wells has dissipated in all areas except along the coast. Pumped wells supply most of the water for irrigation. Water use in the county is regulated, and permits are required for construction and use of wells.

Four methods of irrigation are used for commercial production of crops in the county:

Furrow or row irrigation. In this method, water is released into the rows or furrows. This method is used for crops on the finer textured soils on hammocks. It is also used in some citrus groves on hammocks.

Seepage irrigation. In this method, small ditches are dug at intervals throughout the field. Water is released into the ditches. The water then seeps laterally between the ditches. This method is used where there is a restrictive layer or pan that restrains the downward movement of water. It is commonly used on Myakka and EauGallie soils.

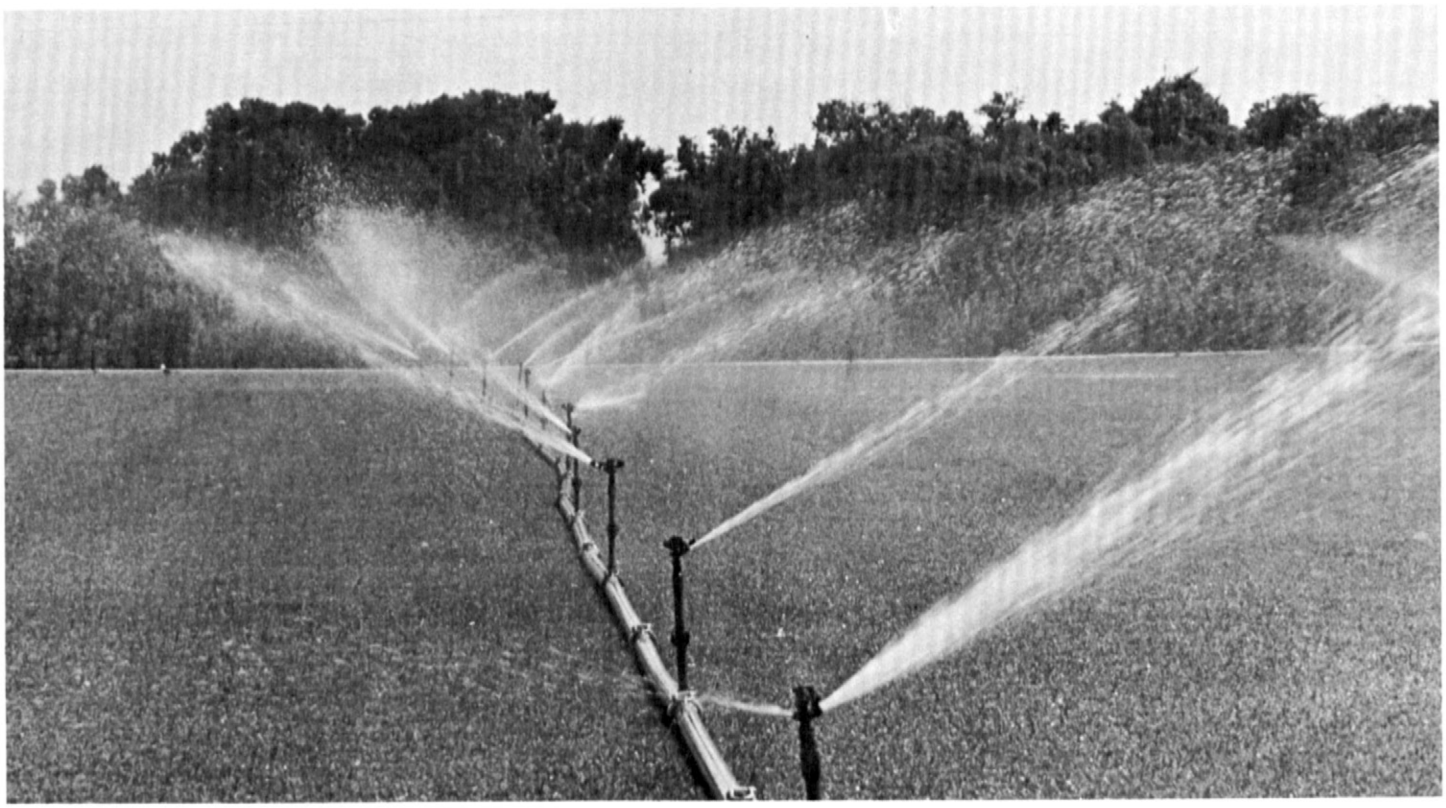


Figure 1.—Overhead irrigation of sod on Wabasso fine sand.

Overhead irrigation. In this method, water under pressure is forced through pipes to sprinklers (fig. 1). The sprinklers are spaced and elevated to give complete coverage to the field. Drip, microjet, and semiclosed open-ditch systems are used in vegetable fields. These are low pressure, high volume systems that use less water and less energy in pumping the water. In semiclosed systems, row ditches distribute water that is delivered to the field by a buried conduit. Outlet valves at the head of the irrigation ditch are regulated to control water use.

Tile irrigation. In some areas tile systems are still in use. These systems distribute water through hollow tiles. The water rises to the surface by capillary action. Tile systems can be designed to provide drainage and control the water table.

population

The population of Manatee County is approximately 135,000. The median age is 48.7 (*6*). It is estimated that the population will exceed 200,000 in 15 to 20 years. Most of the population lives within 15 miles of the gulf coast. The population is unevenly distributed because early settlers favored the western part of the county near large bodies of water that temper the climate and protect the surrounding areas from frost.

farming

In 1978, according to the United States Census of Agriculture, there were 675 farms in Manatee County, and the average size of the farms was 511 acres. The land in farms totaled 345,102 acres. Most of the farms are in the western part of the county on the soils in the hammock areas. Vegetable farms are dominant, and there are some citrus groves. Citrus groves generally are planted on the slightly higher, better drained soils; however, they are also planted on soils that have a high water table if canals are dug to provide drainage. Other citrus-producing areas are near Parrish, Bethany, Oak Knoll, and Duette. Cattle are grazed mainly in the central, eastern, and southeastern parts of the county.

transportation

Three major highways, U.S. 19, U.S. 41, and U.S. 301, pass through Manatee County. Rail service is provided by the Seaboard Coastline Railroad on a route running generally north and south.

The Bradenton-Sarasota Airport is located in Manatee County at a point between those two cities. Scheduled passenger service, air freight service, and air taxi charters are available. Tampa International Airport is 50 minutes away from the Bradenton-Sarasota Airport.

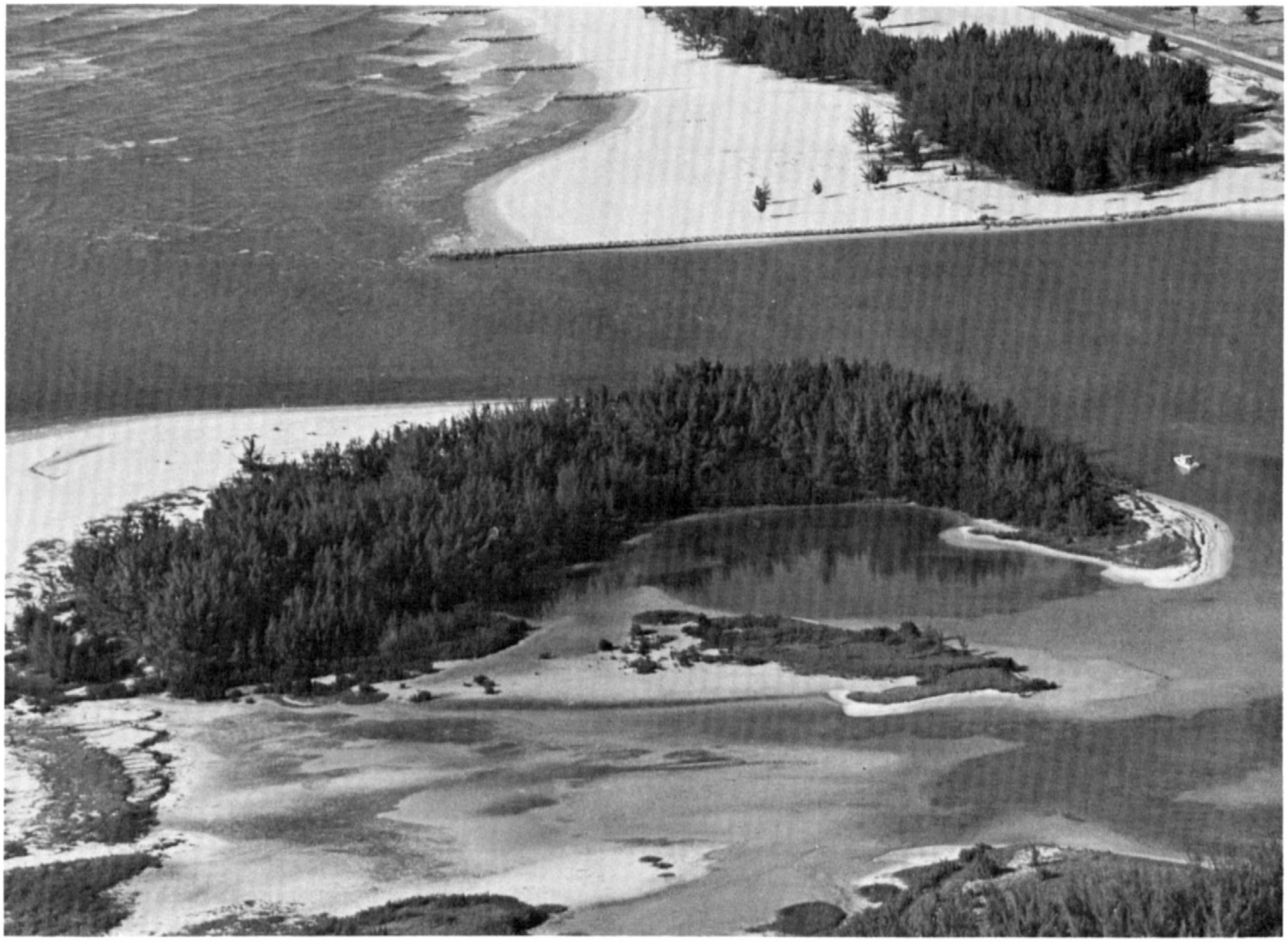


Figure 2.—An area of Beaches and Canaveral fine sand, 0 to 5 percent slopes. The groins along the beach help control shore erosion.

markets

Manatee County, which is approximately midway along the state's Gulf of Mexico coastline, is adjacent to many markets, including Sarasota County to the south and two of the state's largest counties with a major city to the north and northwest. These are Hillsborough County and Pinellas County. Port Manatee, in the northwestern corner of the county, is the second largest port in tonnage on the gulf coast of Florida. It is channeled to Tampa Harbor, the largest shipping center on the gulf coast (*6*).

recreation

Manatee County has approximately 150 miles of shoreline (fig. 2). Areas and facilities for fishing, boating, and other water sports are plentiful.

Many other types of recreation are available. A network of county parks offer planned and supervised recreation programs. The north entrance to Myakka River State Park is in Manatee County. There are public and private facilities for golf, tennis, handball, raquetball, shuffleboard, bowling, and swimming. Two large public beaches, a golf course, several boat ramps, and five fishing piers are maintained by the county.

A major league baseball team trains in Bradenton in the spring. Nearby Tampa has a professional football team and a professional soccer team.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape

of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

This soil survey supersedes the soil survey of Manatee County, Florida, published in 1958 (*10*). This is the first soil survey in Florida to be updated. The soil series in this survey are described to a greater depth than in the previous survey. Many of the series and map unit names have changed because of new information. The soil boundaries are essentially the same as those in the original survey. Random transects were made over most of the soils with a ground penetrating radar machine. Ground truth was made by an SCS soil scientist. The map units, as described, are based on this data and on data in the previous survey.

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general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soils of the sandy ridges and knolls

The soils making up this group are nearly level to gently sloping and moderately well drained to somewhat poorly drained. They are sandy throughout. In most areas the soils have a dark colored subsoil at a depth below 30 inches. The soils are mainly in the northeastern part of the county.

1. Pomello-Cassia-Duette

Nearly level to gently sloping, moderately well drained and somewhat poorly drained sandy soils that have a dark colored subsoil

This map unit consists mostly of nearly level to gently sloping, deep sandy soils on the highest parts of the county. The soils are in small areas on knolls and ridges mostly in the northeastern part of the county. A few areas are near the coast. The vegetation consists of sand pine, live oak, and running oak on the Cassia and Duette soils and live oak, longleaf pine, and sawpalmetto on the Pomello soils.

This map unit makes up about 2 percent, about 11,110 acres, of the survey area. It is about 40 percent Pomello soils, 25 percent Cassia soils, 20 percent Duette soils, and 15 percent soils of minor extent.

Pomello soils generally are in lower positions on the landscape than the Duette soils. They are moderately well drained and are fine sand throughout. The surface layer is thin and gray. The subsurface layer is white. The subsoil is at a depth of 30 to 50 inches. It is black and dark reddish brown.

Cassia soils are in about the same position on the landscape as the Pomello soils. They are somewhat poorly drained to moderately well drained and are fine sand throughout. The surface layer is thin and gray. The subsurface layer is light gray to white. The subsoil begins within a depth of 30 inches. It is black to dark reddish brown. The substratum is very pale brown to light gray.

Duette soils are moderately well drained and are fine sand throughout. The surface layer is very dark gray to grayish brown and is less than 6 inches thick. The subsurface layer is white or light gray. The subsoil is black to dark brown. It is at a depth between 51 and 80 inches.

The soils of minor extent are wetter than the major soils in the map unit. Delray soils are in sloughs. Floridana, Immokalee, and Okeelanta soils are in small depressions that are ponded for long periods. Myakka and Waveland soils are along the edges of the unit.

In most areas, the soils in this unit are in natural vegetation. In some areas they are used as improved pasture or range, and in some areas, mostly near the coast, they are in urban uses.

2. Tavares-Cassia-Zolfo

Nearly level to gently sloping sandy soils; some are moderately well drained and do not have a subsoil, and others are moderately well drained and somewhat poorly drained and have a dark colored subsoil

This map unit consists mainly of nearly level to gently sloping, deep sandy soils on some of the higher parts of the county. The largest area is along Lake Manatee. Other areas are near Parrish and Moody Branch. The vegetation consists mainly of oak and pine and an undergrowth of shrubs and grasses.

This map unit makes up about 1 percent, about 6,241 acres, of the survey area. It is about 30 percent Tavares soils, 15 percent Cassia soils, 15 percent Zolfo soils, and 40 percent soils of minor extent.

Tavares soils are moderately well drained. They are fine sand throughout. The surface layer is very dark gray about 6 or 7 inches thick. The underlying layer is yellowish brown, light yellowish brown, pale brown, and white. In some areas, more commonly near streams,

fragments of iron-cemented sand occur in the lower part of the soil.

Cassia soils are in a slightly lower position than the Tavares soils. They are somewhat poorly drained and moderately well drained and are fine sand throughout. The surface layer is thin and gray or has a salt and pepper appearance. The subsoil is black to dark reddish brown. It is at a depth of less than 30 inches. The substratum is very pale brown to light gray. It extends to a depth of 80 inches.

Zolfo soils are in about the same position as the Cassia soils. They are somewhat poorly drained. The surface layer is very dark gray or gray fine sand 4 to 7 inches thick. The subsurface layer is pale brown to light gray fine sand. The subsoil is at a depth between 51 and 80 inches. It is dark grayish brown to dark brown fine sand.

The soils of minor extent in this unit are Orlando soils near Parrish, Duette soils near Moody Branch, Pomello soils, which are very common throughout the survey area, and EauGallie soils in many of the lower, wetter places.

In most areas the soils in this unit are used for citrus or general farm crops.

Soils of the coastal islands

The soils making up this group are nearly level to gently sloping and somewhat poorly drained to moderately well drained. On the gulf side they are on low coastal dunes and sandy beaches. On the bay side they are nearly level and poorly drained. The soils are sandy; shells and shell fragments are common to many.

3. Canaveral-Beaches-Myakka

Nearly level to gently sloping, moderately well drained to poorly drained sandy soils that have shell fragments; some have a dark colored subsoil

This map unit consists mainly of soils on the larger keys. One area near the northern coastline is adjacent to the mainland. The vegetation consists of salt-tolerant grasses, various other grasses, and scattered cabbage palm, live oak, cedar, myrtle, and sawpalmetto.

This map unit makes up less than 1 percent, about 3,552 acres, of the survey area. It is about 45 percent Canaveral soils, 25 percent Beaches, 25 percent Myakka, shell substratum, soils, and 5 percent soils of minor extent.

Canaveral soils are on moderately low ridges. They consist mainly of a mixture of light-colored quartz sand grains and multicolored shell fragments. They are moderately well drained to somewhat poorly drained.

Beaches are long and narrow and are adjacent to the gulf. They consist of quartz sand and many, generally small shell fragments. They are subject to continuous wave action.

Myakka, shell substratum, soils are the only Myakka soils in this map unit. They are poorly drained. The disturbed surface layer is a mixture of gray, very dark gray, and grayish brown fine sand about 15 inches thick. The subsurface layer is dark gray and light gray fine sand 11 inches thick. The subsoil is black and dark brown fine sand 15 inches thick. The substratum consists of varying amounts of shells, shell fragments, and sand. It extends to a depth of 80 inches or more.

The soils of minor extent in this map unit are Canaveral soils that are underlain by muck and Estero muck.

The soils in this unit are used for urban development and recreation.

Soils of the flatwoods

The soils making up this group are nearly level and moderately well drained to very poorly drained. This group is the largest in the survey area. The soils are in all parts of the survey area except barrier islands and mangrove swamps. In most areas, the soils are sandy throughout and have a dark colored subsoil. In some areas, they are weakly cemented in the subsoil. In some areas, they have a loamy subsoil.

4. Waveland-Pomello-Myakka

Nearly level sandy soils that have a dark colored subsoil; most are poorly drained and are weakly cemented in the subsoil, and others are moderately well drained and are not cemented in the subsoil

This map unit consists of soils in broad flatwoods that are interspersed with low ridges. The soils are dissected by many small creeks. They are in the eastern part of the county. The largest area is a strip about 4 to 6 miles wide, extending from north of Highway 62 and spreading out to Hardee and Sarasota Counties. The natural vegetation consists of South Florida slash pine, sawpalmetto, fetterbush, huckleberry, pine, and pineland threeawn. On some of the ridges it consists of sand pine and live oak.

This map unit makes up about 19 percent, about 89,900 acres, of the survey area. It is about 32 percent Waveland soils, 20 percent Pomello soils, 18 percent Myakka soils, and 30 percent soils of minor extent.

Waveland soils are poorly drained. They are fine sand or sand throughout. The surface layer is black or dark gray fine sand generally less than 10 inches thick. The subsurface layer is grayish brown to white. The subsoil is weakly cemented and has a dark color. It begins at a depth of 30 to 50 inches. The substratum is dark grayish brown to olive gray. It extends to a depth of 80 inches or more.

Pomello soils are moderately well drained. They are at the highest elevations in the unit. They are fine sand throughout. The surface layer is thin and gray. The subsurface layer is thick and white. The subsoil is at a

depth of 30 to 50 inches. It is black and dark reddish brown.

Myakka soils are poorly drained. They are fine sand throughout. The surface layer has a dark color. It is about 4 to 8 inches thick. The subsurface layer is gray or light gray. The subsoil is black to dark brown. It is at a depth of 20 to 30 inches.

The soils of minor extent are Floridana, Immokalee, and Okeelanta soils in numerous small depressions that are ponded for long periods. Anclote, Canova, Delray, Felda, and Palmetto soils are in sloughs and swamps. Cassia and Duette soils are commonly on ridges. EauGallie, Ona, and Pomona soils are in flatwoods.

The soils making up this map unit are well suited to use as improved pasture. In most areas, they are used as improved pasture. In some areas, they are used as range that is cutover and undeveloped. In some areas, they are used for truck crops, mainly tomatoes.

5. Myakka-Waveland-Cassia

Nearly level sandy soils that have a dark colored subsoil; most are poorly drained and are not cemented in the subsoil, some are poorly drained and are weakly cemented in the subsoil, and some are somewhat poorly drained and moderately well drained and are not cemented in the subsoil

This map unit consists of soils in broad flatwoods interspersed with many depressions and dissected by many streams. Areas of soils that are on knolls and are better drained than Myakka, Waveland, and Cassia soils are common in this unit. Myakka, Waveland, and Cassia soils are in very large areas that are east of North Rye Bridge Road. The largest area is 3 to 10 miles wide and spans the entire length of the county. Parrish Lake and Lake Manatee are in this unit. The natural vegetation consists of South Florida slash pine, sawpalmetto, fetterbush, huckleberry, pine, and pineland threeawn. On some of the ridges it also consists of sand pine and live oak.

This unit is the largest in the survey area. It makes up about 33 percent, about 153,300 acres, of the survey area. It is about 40 percent Myakka soils, 18 percent Waveland soils, 11 percent Cassia soils, and 31 percent soils of minor extent.

Myakka soils are poorly drained. They are fine sand throughout. The surface layer has a dark color. It is about 4 to 8 inches thick. The subsurface layer is gray or light gray. The subsoil is black to dark brown. It begins at a depth of 20 to 30 inches.

Waveland soils are poorly drained. The surface layer is black or dark gray fine sand. It is generally less than 10 inches thick. The other layers are fine sand or sand. The subsurface layer is grayish brown to white. The subsoil is weakly cemented and has a dark color. It begins at a depth of 30 to 50 inches. The substratum is dark grayish brown to olive gray. It extends to a depth of 80 inches or more.

Cassia soils are somewhat poorly drained to moderately well drained. They are fine sand throughout. They are on knolls. The surface layer is thin and gray. The subsurface layer is light gray to white. The subsoil is black to dark reddish brown. It is within a depth of 30 inches. The substratum is very pale brown to light gray. It extends to a depth of 80 inches or more.

The soils of minor extent in this unit are Floridana, Immokalee, and Okeelanta soils that are adjacent in many small depressions that are ponded for long periods. Delray and Pomona soils are in sloughs. Felda and Wabasso soils are commonly near major streams and rivers. Duette and Pomello soils are on low ridges and knolls. St. Johns soils are in flatwoods and on some side slopes.

The soils in this map unit are well suited to use as improved pasture. In most areas, they are used as improved pasture. In some areas, they are used as range that is cutover and undeveloped. In some areas they are used for tomatoes and other truck crops.

6. EauGallie-Floridana

Nearly level sandy soils; most are poorly drained and have a subsoil that is dark colored and sandy in the upper part and loamy in the lower part, and some are very poorly drained and have a loamy subsoil

This map unit consists of soils in broad flatwoods interspersed with many depressions that are seasonally ponded and soils on a few low ridges (fig. 3). This is the largest unit west of North Rye Bridge Road. The soils are dissected by most of the rivers and many streams in the county. Most areas are west of North Rye Bridge Road. A few areas are in the southeastern part of the county near Myakka River State Park. The natural vegetation consists of South Florida slash pine, live oak, water oak, cabbage palm, sawpalmetto, fetterbush, huckleberry, and pineland threeawn.

The natural vegetation in the lowest places consists of sawgrass, maidencane, and willow and in some places a few cypresses. In other parts of the depressions, it consists of maidencane, St.-Johnswort, bluestems, smooth cordgrass, and sedges.

This unit makes up about 25 percent, about 116,660 acres, of the survey area. It is about 60 percent EauGallie soils, 8 percent Floridana soils, and 32 percent soils of minor extent.

EauGallie soils are poorly drained. The surface layer is very dark gray fine sand about 5 inches thick. The subsurface layer is grayish brown to light brownish gray fine sand. The subsoil is at a depth of less than 40 inches. The upper part is black to dark brown fine sand. The lower part is grayish brown and is loamy.

Floridana soils are very poorly drained. The surface layer is thick, dark colored fine sand. The subsurface layer is gray fine sand. The subsoil begins at a depth of

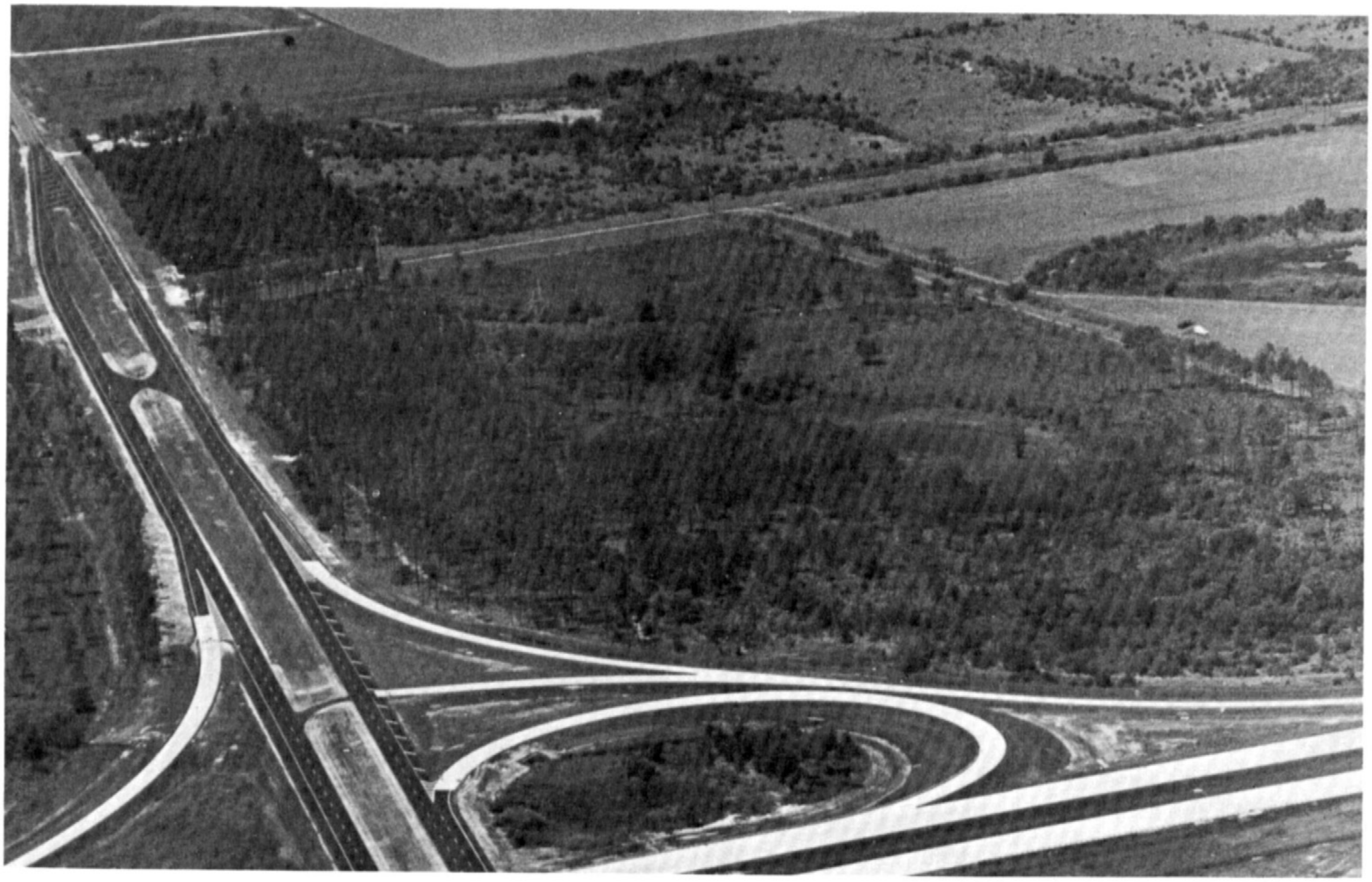

Figure 3.—An area of EauGallie-Floridana soils. These soils are used mainly for improved pasture, but each year more and more acreage is converted to urban uses.

20 to 40 inches. It is dark gray and gray and is loamy. Below the subsoil there is light gray fine sand.

The soils of minor extent are Cassia and Pomello soils at the highest elevations; Delray, Palmetto, and Immokalee soils in some of the sloughs and depressions; Anclote, Canova, and Okeelanta soils in more swampy areas; and Wabasso, Pinellas, and Myakka soils in flatwoods.

The soils in this unit are used for improved pasture, truck farming, and urban development.

7. Wabasso-Bradenton-EauGallie

Nearly level, poorly drained soils; most have a subsoil that is dark colored and sandy in the upper part and loamy in the lower part, and some have a loamy subsoil and are underlain by limestone

This map unit consists of soils in flatwoods and on hammocks. Most areas are in the western part of the county. A few areas are in the southeastern part of the county near Myakka River State Park. Individual areas are irregular in shape and are north and south of the Manatee River. The natural vegetation is longleaf and slash pine, cabbage palm, live oak, magnolia, sawpalmetto, inkberry, waxmyrtle, bluestem, indiangrass, Florida paspalum, pineland threeawn, panicum, deertongue, grassleaf goldaster, huckleberry, and running oak.

This unit makes up about 9 percent, about 40,255 acres, of the survey area. It is about 24 percent Wabasso soils, 17 percent Bradenton soils, 15 percent EauGallie soils, and 44 percent soils of minor extent.

Wabasso soils are poorly drained. The surface layer is very dark gray fine sand about 7 inches thick. The subsurface layer is gray fine sand. The subsoil to a depth of less than 40 inches is fine sand coated with organic material. At a depth between 25 and 40 inches it is grayish brown to gray loamy material. The substratum to a depth of 80 inches or more consists of sand and many shell fragments.

Bradenton soils are on low-lying ridges and hammocks. They are poorly drained. In most areas, the surface layer is very dark gray fine sand about 6 inches

thick. The subsurface layer is thin and is grayish brown to brown fine sand. The subsoil begins at a depth of less than 20 inches. It is fine sandy loam. It is grayish brown in the upper part and mottled grayish brown, light brownish gray, and yellowish brown in the lower part. In most areas this soil is underlain by hard limestone that has fractures and solution holes.

EauGallie soils are poorly drained. The surface layer is very dark gray fine sand about 5 inches thick. The subsurface layer is grayish brown to light brownish gray fine sand. The subsoil in the upper part is black to dark brown fine sand, and in the lower part, at a depth below 40 inches, it is grayish brown sandy clay loam.

The soils of minor extent are mainly in depressions and generally are ponded for long periods. Anclote, Canova, Okeelanta, Floridana, Immokalee, and Chobee soils are in depressions, and in most areas they have been drained. Pinellas soils are in the same position on the landscape as Bradenton soils.

The soils in this map unit are used for improved pasture, truck farming, and urban development.

Soils of the wet depressions, flood plains, swamps, and marshes

The soils making up this group are poorly drained and very poorly drained. The poorly drained soils are subject to flooding. They are loamy beginning at a depth of 20 to 40 inches. In some areas these soils have a dark colored sandy subsoil overlying loamy material. In most areas the very poorly drained soils are subject to ponding or tidal flooding. The surface layer is thick and has a dark color. In some areas, these soils have a loamy subsoil below a depth of 20 inches. In some areas, they are organic and have mineral material beginning at a depth of 16 to 51 inches. In some areas, they are sandy and have a dark colored subsoil.

8. Delray-Floridana

Nearly level, very poorly drained sandy soils mainly in depressions; they have a loamy subsoil

This map unit consists mostly of very poorly drained soils that are nearly level to depressional. The soils are in small areas in the western and southeastern parts of the county. In most areas they are narrow and winding to irregular in shape. The native vegetation consists mostly of water tolerant grasses such as bluestems, cattail, lopsided Indiangrass, maidencane, St.-Johnswort, pineland threeawn, and sawgrass. In some areas, it consists of waxmyrtle, sedges, or scattered cypress, bay, sweetgum, maple, or willow.

This unit makes up about 5 percent, about 24,115 acres, of the survey area. It is about 40 percent Delray soils, 10 percent Floridana soils, and 50 percent soils of minor extent.

Delray soils have a surface layer of black to very dark gray mucky loamy fine sand or fine sand more than 10 inches thick. The subsurface layer is grayish brown or light brownish gray fine sand. The subsoil begins at a depth of more than 40 inches. It is grayish brown to greenish gray fine sandy loam to sandy clay loam.

Floridana soils have a surface layer of thick, dark colored fine sand. The subsurface layer is gray fine sand. The subsoil is at a depth of 20 to 40 inches. It is dark gray and gray and is loamy. Below the subsoil there is light gray fine sand.

The soils of minor extent in this map unit are Anclote, Bradenton, Canova, Felda, Okeelanta, Palmetto, and Parkwood soils.

In some areas the soils in this unit are in natural vegetation. In many areas they have been drained and are used for improved pasture or, more commonly, for truck farming.

9. Felda-Wabasso

Nearly level, poorly drained sandy soils on flood plains; some have a loamy subsoil, and others have a subsoil that is dark colored and sandy in the upper part and loamy in the lower part

This map unit consists of nearly level soils adjacent to major rivers. The soils are frequently subject to overflow. The largest area is just south of Taylor Creek and along the Myakka River to the Sarasota County line. Areas are long, narrow, and winding. The natural vegetation consists mostly of gum, oak, maple, hickory, bay, and magnolia in the lower areas and scattered pine and sawpalmetto on low ridges. In a few places it also consists of water tolerant grasses.

This unit makes up about 2 percent, about 9,510 acres, of the survey area. It is about 60 percent Felda and closely similar soils, 25 percent Wabasso and closely similar soils, and 15 percent soils of minor extent.

Felda soils have a surface layer of very dark gray fine sand 3 to 5 inches thick. The subsurface layer is gray to grayish brown fine sand. The subsoil begins at a depth of 20 to 40 inches. It is gray to grayish brown sandy loam to sandy clay loam.

Wabasso soils have a surface layer of very dark gray fine sand about 7 inches thick. The subsurface layer is gray fine sand. The subsoil to a depth of 25 to 40 inches is fine sand that is coated with organic material. At a depth between 25 and 40 inches it is grayish brown to gray loamy material. Below that, there is sand and many shell fragments.

The soils of minor extent in this map unit are the Anclote, Floridana, Bradenton, and Chobee soils.

In almost all areas the soils in this unit are in natural vegetation.

10. Estero-Wulfert-Kesson

Nearly level, very poorly drained sandy and organic soils in tidal mangrove swamps

This map unit consists of very poorly drained soils in mangrove swamps. The soils are in narrow strips adjacent to bays. They are flooded daily by high tides. The largest area is between Tampa Bay and Terra Ceia Bay. It is about 1 to 2 miles wide and 8 miles long. The natural vegetation consists mainly of black mangrove. In some areas it consists of seashore saltgrass, batis, and oxeye daisy. A few spots are bare.

This map unit makes up about 2 percent, about 9,446 acres, of the survey area. It is about 70 percent Estero soils, 15 percent Wulfert soils, 10 percent Kesson soils, and 5 percent soils of minor extent.

Estero soils have a thin layer of muck on the surface. Below that, there is fine sand. The surface layer is black and very dark gray. It is about 14 inches thick. The subsurface layer is light brownish gray and grayish brown. The subsoil is fine sand that is coated with organic material and has a dark color. It begins at a depth of 31 to 56 inches. The substratum is grayish brown. It extends to a depth of 80 inches or more.

Wulfert soils consist of dark reddish brown to dark brown muck 16 to 51 inches thick and, below that, gray fine sand. These soils have a high content of sulfur and may become very acid after drying.

Kesson soils have a surface layer of black fine sand about 6 inches thick. Beneath the surface layer there is pale brown, light gray, and white fine sand and a few shell fragments. These soils have a high content of sulfur and may become very acid after drying.

Beaches is the most common soil of minor extent in this unit. The other minor soils are Bradenton, Myakka, and Wabasso soils. Also, there are many areas of shallow water in this unit.

11. Tomoka

Nearly level, very poorly drained organic soils in freshwater marshes

This map unit consists of nearly level, very poorly drained organic soils in freshwater marshes. There are only two areas of this map unit in the county. The larger of the two is oblong; it surrounds Cason Lake and covers about 4 square miles. The natural vegetation in both areas consists of maidencane, sawgrass, cattail, and flags and scattered to dense thickets of woody button bush. In a few areas it consists of swamp hardwoods such as maple, gum, bay, and other wetland hardwoods.

This unit makes up less than 1 percent, about 3,041 acres, of the survey area. It is 90 percent Tomoka soils and 10 percent minor soils.

Tomoka soils have a layer of black to dark reddish brown muck at the surface. The muck is 16 to 51 inches thick. Below that, there is sand, loamy sand, and gray sandy clay loam.

The soils of minor extent are Anclote, Canova, Floridana, and Okeelanta soils.

In most areas the soils in this unit are used as range or improved pasture. In a few areas the soils are in wetland hardwoods.

12. Okeelanta

Nearly level, very poorly drained organic soils on flood plains

This map unit consists of nearly level, very poorly drained organic soils in long and narrow areas along the Manatee and Braden Rivers in the western part of the county. The soils are on the lower parts of the flood plain. They are subject to tidal and river flooding and are normally flooded at high tide. The natural vegetation consists mainly of needlegrass rush, seashore saltgrass, marshhay cordgrass, big cordgrass, and smooth cordgrass.

This map unit makes up about 1 percent, about 4,320 acres, of the survey area. It is about 42 percent Okeelanta soils and 58 percent soils of minor extent and areas of water.

Okeelanta soils have a layer of black to dark reddish brown muck at the surface. The muck is 16 to 51 inches thick. Below that, there is black to light brownish gray or gray sand.

The soils of minor extent are the Felda and Wabasso soils in upstream areas and the Myakka, tidal, soils near the mouth of the rivers that run through the map unit.

The soils in this unit are in natural vegetation, mainly because only diking and pumping can be used in water control. In some areas the soils are used as range.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Myakka fine sand, 0 to 2 percent slopes, is one of several phases in the Myakka series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. St. Johns-Myakka complex is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Floridana-Immokalee-Okeelanta association is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Canova, Anclote, and Okeelanta soils is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Beaches is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 2 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

1—Adamsville Variant fine sand. This is a nearly level, somewhat poorly drained soil on low ridges that are slightly higher than the surrounding flatwoods. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand 8 inches thick. Below the surface layer, there is grayish brown fine sand 18 inches thick and very pale brown fine sand 13 inches thick. Below that, to a depth of 80 inches or more there is light gray fine sand.

Included with this soil in mapping are small areas of Ona, Myakka, St. Johns, and Orlando soils.

In most years, if this soil is not drained, the water table is at a depth of 20 to 40 inches for 2 to 6 months out of the year. In some years, it is at a depth of 10 to 20

inches for periods of as much as 2 weeks. In most years, it is within a depth of 60 inches for more than 9 months out of the year. Permeability is rapid throughout the soil. The available water capacity is low in the surface layer and very low in the other layers. Natural fertility is low.

The natural vegetation consists of pine, laurel and water oak, sawpalmetto, pineland threeawn, indiangrass, bluestems, and low panicums.

Periodic wetness is a severe limitation to use of this soil for cultivated crops. Very few crops can be grown unless intensive water control measures are used. This soil is well suited to many kinds of flowers and vegetables if a water control system is installed to remove excess water in wet seasons and distribute water for subsurface irrigation in dry seasons. Other important management practices include crop rotations with a close growing crop on the soil at least two-thirds of the time. Fertilizer and lime should be added according to the needs of the crops.

This soil is moderately suited to citrus if a well designed drainage system removes excess water rapidly to a depth of about 4 feet. It is used for citrus in many areas. The trees should be planted in beds. A cover of close growing vegetation maintained between the trees helps protect the soil from blowing in dry weather and from washing during heavy rains. Regular applications of fertilizer are needed. For highest yields, irrigation is required in seasons of low rainfall. Either sprinklers or subsurface irrigation through the water control system may be used.

This soil is well suited to use as pasture. It is used as pasture in many areas. Pangolagrass and bahiagrass are well adapted. Simple drainage is needed to remove excess surface water in periods of high rainfall. Regular use of fertilizers is also needed. Carefully controlled grazing helps maintain healthy plants for highest yields.

The potential productivity for pine trees is moderately high. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

2—Beaches. Beaches consist of nearly level to sloping, narrow strips of tide-washed sands and shell fragments. They are along the Gulf of Mexico shoreline and on the larger islands and keys. The most extensive areas are on Anna Maria and Longboat Keys.

Beaches typically consist of loose, gray to white fine sand mixed with various quantities of broken shells. The sand ranges from fine to coarse. Shell fragments are mostly sand size, but in places there are coarser fragments or whole shells throughout the soil or in pockets or lenses. The soil layers differ only in color or in shell content, or the soil has uniform color and shell content throughout.

Beaches range from less than 100 feet to more than 500 feet in width. As much as half of the beach may be flooded daily by high tides, and all of the beach may be flooded by storm tides. Beaches in most places slope gently to the water's edge, but shape and slope can change with every storm.

Beaches are not suitable for cultivation or for use as woodland. Most areas are barren.

This unit is not assigned to a capability subclass or a range site.

3—Braden fine sand. This is a nearly level to very gently sloping, somewhat poorly drained soil on stream terraces that are well above normal overflow. Slopes are smooth and are 0 to 3 percent. They generally grade toward the stream.

Typically, the surface layer is very dark gray fine sand about 4 inches thick. The subsurface layer, to a depth of 28 inches, is grayish brown, brown, dark brown, light yellowish brown, and yellow fine sand. The subsoil, to a depth of 44 inches, is yellowish brown fine sandy loam. The substratum to a depth of 70 inches or more is light gray, gray, and light brownish gray fine sand and sand.

Included with this soil in mapping are areas of soils on similar landscapes; however, those soils are sandy to a depth of 80 inches or more. Also included are a few areas where the subsoil is at a depth of less than 20 inches and some places where a brownish organic stained layer is in the surface layer.

In most years, the water table is at a depth of 30 to 40 inches for 1 to 3 months out of the year. It rises above a depth of 30 inches briefly during periods of heavy rainfall. The soil is flooded rarely for brief periods following abnormally high rainfall. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is medium in the surface layer and subsoil and low in the subsurface layer and substratum.

The natural vegetation consists of open forest of slash pine and live oak and a ground cover of sawpalmetto, creeping bluestem, panicum, and pineland threeawn. Most areas are used as range.

Droughtiness and rapid leaching of plant nutrients in the thick sandy surface layer are severe limitations to use of this soil for cultivated crops. If the soil is cultivated, special soil improving measures are needed. Crop rotations should keep close growing vegetation on the soil at least two-thirds of the time. All crops need frequent fertilizing and liming. Irrigation of a few high value crops is feasible where irrigation water is readily available.

The soil is well suited to citrus in areas that are relatively free from freezing temperatures. Close growing plants between the trees help protect the soil from blowing. Good yields of oranges and grapefruit generally can be obtained without irrigation. The yields of these

crops can be increased by irrigation where water for irrigation is readily available.

The soil is well suited to pasture and hay crops. In some areas it is used as improved pasture. Deep rooting plants such as Coastal bermudagrass and bahiagrasses generally grow well if the soil is well fertilized and limed. Production is occasionally restricted by extended droughts. Controlled grazing helps maintain vigorous plants for highest yields.

The potential productivity for pine trees is moderately high. Seedling mortality is the main management concern. Slash pine is the best tree to plant.

This soil is in capability subclass IIIs and in the South Florida Flatwoods range site.

4—Bradenton fine sand. This is a poorly drained soil on low-lying ridges and hammocks. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is dark gray fine sand about 4 inches thick. The subsurface layer is grayish brown fine sand 5 inches thick. The subsoil is dark gray and gray fine sandy loam about 18 inches thick. Below the subsoil there is a layer of gray loamy fine sand 11 inches thick, and below that, there is light gray marl to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Parkwood, Floridana, Chobee, Felda, and Manatee soils. Also included are a few areas where the subsoil is finer textured than that of this Bradenton soil and a few areas where a brown sandy layer overlies the subsoil.

If this Bradenton soil is not drained, the water table is within 10 inches of the surface for 2 to 6 months out of the year and at a depth between 10 and 40 inches for much of the remainder of the year. In dry seasons the water table recedes to a depth of 40 inches. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil and substratum. The available water capacity is low in the surface layer and substratum, very low in the subsurface layer, and medium in the subsoil.

In many areas this soil is used for citrus and for urban development. In some areas the soil is in vegetables, and in some areas it is in improved pasture. The native vegetation consists of slash pine, laurel and live oak, cabbage palm, waxmyrtle, magnolia, bluestem, sawpalmetto, and various vines.

Wetness is a severe limitation to use of this soil for cultivated crops. The soil is suitable for many fruit and vegetable crops if a water control system is installed to remove excess surface water and internal water rapidly. The system should also distribute water for subsurface irrigation. Cover crops and crop residue help protect the soil from erosion. Other important management practices are crop rotation that keeps the soil in a close growing crop at least two-thirds of the time, good seedbed preparation, including bedding, and fertilizers applied according to the needs of the crop.

This soil is well suited to citrus if a water control system maintains drainage to a depth of about 4 feet. Bedding and planting the trees in the beds help provide good surface drainage. Close growing vegetation maintained between the trees helps protect the soil from blowing in dry weather and from washing during rains. Regular applications of fertilizer are needed. Applications of lime are not needed.

This is an excellent soil for pasture. It is well suited to pangolagrass, bahiagrass, and clover. Pastures of grass only or a grass-clover mixture can be grown under good management. Regular application of fertilizer and controlled grazing are needed for highest yields.

The potential productivity for pine trees is moderately high. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIw and in the Cabbage Palm Hammock range site.

5—Bradenton fine sand, limestone substratum. This is a nearly level, poorly drained soil on low-lying ridges and hammocks. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand 6 inches thick. The subsurface layer in the upper part is grayish brown fine sand 11 inches thick and the lower part is brown fine sand 2 inches thick. The subsoil is fine sandy loam to a depth of 47 inches. In the upper part it is grayish brown to a depth of 30 inches, and below that, it is mottled grayish brown, light brownish gray, and yellowish brown. Below the subsoil there is hard limestone that has fractures and solution holes.

Included with this soil in mapping are areas of similar soils where limestone is slightly above a depth of 40 inches and areas of soils where the limestone is below a depth of 80 inches. In a few places the subsoil is sandy clay loam.

If this Bradenton soil is not drained, the water table is within 10 inches of the surface for 2 to 6 months out of the year and at a depth of 10 to 40 inches for much of the remainder of the year. In dry seasons the water table recedes to a depth of more than 40 inches. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is low in the surface layer, very low in the subsurface layer, and medium in the subsoil.

Many areas are used for citrus or urban development. Some areas are used for vegetables. The native vegetation consists of slash pine, laurel and live oak, cabbage palm, waxmyrtle, magnolia, bluestems, sawpalmetto, and various vines.

Wetness is a severe limitations to use of this soil for cultivated crops. The soil is suitable for many fruit and vegetable crops if a complete water control system is installed to remove excess surface and internal water rapidly and distribute water for subsurface irrigation.

Good management also includes seedbed preparation, including bedding and fertilizing, and crop rotations that keep a close growing crop on the soil at least two-thirds of the time. Cover crops and all other crop residue help protect the soil from erosion.

This soil is well suited to citrus if a water control system is installed to maintain drainage to a depth of about 4 feet. Bedding and planting the trees in beds help provide surface drainage. Close growing vegetation maintained between the trees helps protect the soil from blowing in dry weather and washing during rains. Regular applications of fertilizer are required. Applications of lime are not needed.

This is an excellent soil for pasture. In some areas it is used as improved pasture. It is well suited to pangolagrass, bahiagrasses, and clover. Pasture of grass alone or a grass-clover mixture can be grown under good management. Controlled grazing and regular applications of fertilizers are needed for highest yields.

The potential productivity for pine trees is moderately high. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIw and in the Cabbage Palm Hammock range site.

6—Broward Variant fine sand. This is a nearly level, poorly drained soil in flatwoods in the western part of the county. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand about 6 inches thick. The subsurface layer is light gray fine sand about 8 inches thick. The subsoil in the upper part is very dark brown fine sand 6 inches thick and in the lower part is brown fine sand 7 inches thick. The substratum is light brownish gray fine sand 7 inches thick. Below that, there is limestone 21 inches thick and light gray fine sand.

Included with this soil in mapping are areas of similar soils that have limestone below a depth of 40 inches. Also included are small areas of Wabasso Variant and Myakka soils.

In most years, if this soil is not drained, the water table is at a depth of 10 to 40 inches for more than 5 months out of the year. It is at a depth of less than 10 inches for 1 to 4 months in wet seasons and is at a depth of more than 40 inches in very dry seasons. The available water capacity is very low or low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility is low.

The native vegetation consists of longleaf pine, slash pine, and cabbage palm and an undergrowth that is dominantly sawpalmetto, pineland threeawn, inkberry, lopsided indiangrass, chalky and creeping bluestem, hairy panicum, and fetterbush lyonia.

Wetness, shallowness to rock, and rapid leaching of plant nutrients are very severe limitations to use of this soil for cultivated crops. Most crops are poorly adapted unless water control practices are used. With water control, the soil is only fairly suitable for most crops. Crop rotations should keep close growing plants on the soil at least three-fourths of the time. Only certain kinds of crops can produce good yields without irrigation. Irrigation of crops is generally not feasible.

The soil is only fairly suitable for citrus. Close growing plants between the trees help protect the soil from blowing or washing. Without irrigation, only fair yields of oranges and grapefruit can be obtained. A well designed irrigation system that maintains optimum moisture conditions is needed to obtain best yields.

This soil is moderately suited to pasture. Coastal bermudagrass and bahiagrass are moderately adapted. Regular fertilizing and occasional liming are needed. Controlled grazing helps maintain plant vigor for best yields.

The potential productivity for pine trees is moderate. Slash pine is the best tree to plant. The main management problems are equipment limitations during periods of heavy rainfall, seedling mortality, and plant competition.

This soil is in capability subclass IVw and in the South Florida Flatwoods range site.

7—Canova, Anclote, and Okeelanta soils. This map unit consists of nearly level, very poorly drained mineral and organic soils in freshwater swamps and in broad, poorly defined drainageways. It is about 40 percent Canova soils, 25 percent Anclote soils, 20 percent Okeelanta soils, and 15 percent other soils, but the proportion varies in each mapped area. Individual areas of each soil are large enough to map separately, but because of present and predicted use they were not separated in mapping. In a typical mapped area, Okeelanta soils are in the lowest places; Anclote soils in the highest places, generally near the edges; and Canova soils in an intermediate position. In the poorly defined drainageways, the Anclote soils and to a lesser extent the Canova soils are adjacent to the streams. Slopes are less than 2 percent.

Typically, the surface layer of Canova soils is dark reddish brown muck 8 inches thick and dark gray fine sand 9 inches thick. The subsurface layer is gray fine sand 7 inches thick. The subsoil is gray sandy clay loam about 39 inches thick. The substratum is gray fine sandy loam.

In most years, Canova soils are ponded, or the water table is at or near the surface for 9 months or more out of the year. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is high in the surface layer, very low in the subsurface layer, and medium in the subsoil.

Typically, the surface layer of Anclote soils is black fine sand 16 inches thick. Below that, to a depth of 80 inches or more, there is grayish brown, gray, and light gray fine sand.

In most years, Anclote soils are ponded, or the water table is at or near the surface for 9 months or more out of the year. Permeability is rapid throughout. The available water capacity is medium in the surface layer and low in the other layers.

Typically, the surface layer of Okeelanta soils is black muck 20 inches thick. Below the surface layer, there is black sand 7 inches thick, grayish brown sand 4 inches thick, and light brownish gray sand 29 inches thick.

In most years, Okeelanta soils are ponded, or the water table is at or near the surface for 9 months or more out of the year. Permeability is rapid throughout. The available water capacity if very high in the surface layer and low in the other layers.

The most extensive minor soils are the Chobee, Floridana, and Manatee soils.

The soils making up this map unit are mainly in natural vegetation consisting of bay, gum, ash, swamp maple, water oak, scattered cypress, and some slash pine. In many areas they support a thick undergrowth of vines, briers, and water-loving plants.

These soils are well suited to many locally important crops only if a well designed and maintained water control system removes excess water rapidly during heavy rains. Additional important management practices include seedbed preparation, crop rotation, and regular applications of fertilizer. Cover crops should be rotated with row crops and should be on the soil two-thirds of the time. Crop residue and cover crops help protect the soil from erosion.

These soils are not suitable for citrus. With water control, the Anclote and Canova soils are moderately suited to citrus except in areas where they are subject to cold damage. The trees should be planted in beds, and close growing vegetation is necessary between the trees. Regular fertilizing is needed.

These soils are too wet for improved pasture grasses. They are well suited to several improved grasses and legumes if simple drainage measures remove excess water after heavy rains. Pangolagrass and white clover grow well if the soils are adequately fertilized and limed. Controlled grazing helps maintain plant vigor for best yields.

The potential productivity for pine trees is high on Canova and Anclote soils, but planting is feasible only in areas that are adequately drained. Slash pine is the best tree to plant. Equipment limitations and seedling mortality are the main management concerns. Okeelanta soils are not suitable for pine trees.

The soils are in capability subclass IIIw. They are not assigned to a range site.

8—Canaveral fine sand, 0 to 5 percent slopes. This is a nearly level to gently sloping, moderately well drained to somewhat poorly drained soil on narrow to

Figure 4.—An area of Canaveral fine sand, 0 to 5 percent slopes. This soil is mainly on the Gulf side of the keys along the mainland. The areas range in width from a few hundred yards to 2 miles.

broad dunelike ridges on the larger islands and keys and in some places on the mainland (fig. 4). The most extensive areas are on Anna Maria and Longboat Keys, and they range from a few hundred yards to 2 miles in width.

Typically, the surface layer is dark grayish brown fine sand about 6 inches thick. The underlying material to a depth of about 17 inches is yellowish brown fine sand. Below that, to a depth of 34 inches it is light yellowish brown fine sand and about 45 percent shell fragments. It is very pale brown sand and shell fragments to a depth of 65 inches or more.

Included with this soil in mapping are small areas of similar soils that are poorly drained and small areas of Myakka soils.

In most years, if this soil is not drained, the water table is at a depth of 10 to 40 inches for 2 to 6 months out of the year and at a depth of 40 to 60 inches for 4 to 8 months out of the year. Permeability is very rapid throughout. Natural fertility is low, and the organic matter content is low. The available water capacity is very low.

The natural vegetation consists of salt-tolerant grasses and scattered palmetto in areas near the Gulf of Mexico.

This soil is not suitable for cultivated field crops. It is only fairly suitable for citrus and pasture. The potential productivity for pine trees is low.

This soil is in capability subclass VIs. It is not assigned to a range site.

9—Canaveral sand, filled. This is a nearly level, moderately well drained to somewhat poorly drained soil that consists of sand and shells that have been dredged or excavated from water areas and then leveled and smoothed, mainly for urban use. Slopes are less than 2 percent.

The fill material varies within short distances. It ranges from about 20 to more than 80 inches in thickness. It is about 10 to 80 percent shells. The sand is fine to coarse. In some places there are balls of clayey or loamy material. The underlying material is mostly mineral, but in a few small areas it is organic.

In most areas this soil is artificially drained. In wet seasons the water table is at a depth of about 40 to 60 inches. The depth to the water table depends on the thickness of the fill material. Permeability is very rapid, and the available water capacity is very low.

In many areas this soil is barren of vegetation. In some places the vegetation consists of weeds and bushes.

The present and predicted use of this soil for urban development precludes its use as woodland or for cultivated crops, citrus, or pasture.

This soil is in capability subclass VIs. It is not assigned to a range site.

10—Canaveral sand, organic substratum. This is a nearly level, moderately well drained to somewhat poorly drained soil consisting of sand and shells overlying organic material. The sand and shells have been dredged or excavated from water areas and deposited on tidal swamps or marshes. The areas have been leveled and smoothed for urban use. Slopes are less than 2 percent.

The fill material varies within short distances. It ranges from about 40 to 70 inches in thickness but commonly is about 45 inches thick. It is about 10 to 80 percent shells. The sand is fine to coarse. In some places there are balls of clayey or loamy material. In most places, within a depth of 8 inches, a second layer of mineral material underlies a layer of muck.

In most areas this soil is artificially drained. In wet seasons the water table is at a depth of about 30 to 60 inches. The depth to the water table depends on the thickness of the fill material. Permeability is very rapid in the fill material and moderately rapid in the organic layer. The available water capacity is very low in the fill material and very high in the organic layer.

In many areas this soil is barren of vegetation. In some places there are weeds and bushes.

The present and predicted use of this soil for urban development precludes its use as woodland or for cultivated crops, citrus, or pasture.

This soil is in capability subclass VIs. It is not assigned to a range site.

11—Cassia fine sand. This is a nearly level, somewhat poorly drained soil on low ridges and knolls that are slightly higher than the adjacent flatwoods. Slopes range from 0 to 2 percent.

Typically, the surface layer is gray fine sand about 3 inches thick. The subsurface layer is light gray to white fine sand about 21 inches thick. The subsoil is black to dark reddish brown fine sand coated with organic material and is about 9 inches thick. The substratum to a depth of 80 inches or more is very pale brown and light gray fine sand.

Included with this soil in mapping are areas of Myakka and Pomello soils and soils that are similar to Cassia soils except that they are weakly cemented in the subsoil.

The water table is at a depth of 15 to 40 inches for about 6 months out of the year and below a depth of 40 inches during dry periods. The available water capacity is very low except in the subsoil, where it is medium. Natural fertility is low. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil.

The natural vegetation consists of scattered slash and longleaf pine, dwarf oak and sand live oak, sawpalmetto, pineland threeawn, running oak, and broomsedge bluestem. Most areas are used as range.

This soil generally is not suited to cultivated field crops or to citrus. In some irrigated areas it is used for these

crops. In some places it is used for watermelons.

This soil is poorly suited to pasture. Grasses such as pangolagrass and bahiagrass grow poorly even if the soil is fertilized. Clovers are not adapted.

The potential productivity is low for pine trees. High seedling mortality is the main management concern. Slash pine is better for planting than other trees.

This soil is in capability subclass VIs and in the Sand Pine Scrub range site.

12—Cassia fine sand, moderately well drained. This is a moderately well drained, nearly level soil on low ridges and knolls in the uplands. Areas are irregular in shape and range in size from about 5 to 100 acres. Slopes are convex and range from 0 to 2 percent.

Typically, the surface layer is grayish brown fine sand about 5 inches thick. The subsurface layer is light gray to white fine sand. It extends to a depth of 29 inches. The subsoil is dark brown fine sand. It extends to a depth of 41 inches. Below the subsoil there is a layer of pale brown to white fine sand.

Included with this soil in mapping are areas of Pomello soils. Also included are areas of soils that are similar to the Cassia soils except that the subsoil is below a depth of 50 inches.

The water table is at a depth of 40 to 60 inches for 1 to 4 months out of the year but rises to within 40 inches of the surface for less than 2 weeks during very wet seasons. It recedes to a depth of more than 60 inches during very dry periods. Permeability is very rapid in the surface and subsurface layers and in the substratum and moderately rapid in the subsoil. The available water capacity is medium in the subsoil and very low in the other layers.

The native vegetation consists of scrub live oak and scrub oak, sawpalmetto, sand pine, pricklypear, rosemary, and pineland threeawn.

This soil generally is not suited to cultivated field crops or citrus. If it is irrigated, crops and citrus can be grown. Watermelon is the most common crop.

This soil is poorly suited to pasture. Grasses such as pangolagrass and bahiagrass grow poorly even if the soil is fertilized. Clovers are not adapted.

The potential productivity for pine trees is low. High seedling mortality is the main management concern. Sand pine is better for planting than other trees.

This soil is in capability subclass VIs and in the Sand Pine Scrub range site.

13—Chobee loamy fine sand. This is a nearly level, very poorly drained soil that is in small to large depressions, poorly defined drainageways, and on broad, low flats. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is black loamy fine sand about 8 inches thick. The subsoil is sandy clay loam 43 inches thick. In the upper part it is very dark gray to a depth of 44 inches, and below that, it is dark gray. The substratum to a depth of 80 inches or more is calcareous gray loamy fine sand and fine sand.

Included with this soil in mapping are small areas of Floridana, Gator, Delray, Manatee, and Felda soils. Also included are small areas of soils that are similar to the Chobee soils except that organic material 6 to 16 inches thick is on the surface and a few areas where the surface layer is loamy fine sand or sandy loam.

In most years, the water table is above the surface or within a depth of 10 inches for 6 to 9 months or more out of the year. It is at a depth of 10 to 30 inches for short periods during dry seasons. The available water capacity is medium in all layers. Permeability is moderately rapid in the surface layer and slow or very slow in the subsoil and substratum. Natural fertility is medium.

In some areas this soil is in improved pasture, vegetables, and citrus. The natural vegetation in swampy areas consists of red maple, water oak, and cabbage palm and an understory of ferns and water tolerant grasses. In areas of open marshes and depressions it consists of maidencane, pickerelweed, smartweed, and patches of sawgrass.

This soil is well suited to many adapted vegetable crops if a well designed and maintained water control system removes excess surface water rapidly. Other management practices are good seedbed preparation, bedding to help lower the water table, and rotating crops with soil improving crops. Crop residues and cover crops help protect the soil from erosion. Fertilizer is needed.

This soil is suited to citrus only if the water table is maintained at a depth of about 4 feet. Planting the trees in beds helps lower the depth of the water table. Cover crops between the trees reduce soil blowing or washing. Fertilizer is needed.

This soil is well suited to improved pasture grasses. A water control system is needed to remove excess surface water rapidly. High yields of pangolagrass, bahiagrass, and white clover can be obtained with adequate fertilizing. Controlled grazing helps maintain plant vigor.

The potential productivity for pine trees is high if a water control system removes excess surface water. Equipment limitations, seedling mortality, and plant competition are the major management concerns.

This soil is in capability subclass IIIw. It is not assigned to a range site.

14—Chobee Variant sandy clay loam. This is a nearly level, very poorly drained soil in shallow depressions. Slopes are concave and less than 2 percent.

Typically, the surface layer is black to very dark gray sandy clay loam about 20 inches thick. The subsoil to a depth of 35 inches is sandy clay loam, and to a depth of 40 inches it is sandy loam. It is light gray and very high in carbonates. The substratum is light gray loamy sand to a depth of 70 inches and light gray and brownish yellow sand and common shell fragments to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Floridana soils and a few small areas of organic soils.

The water table is at a depth of less than 10 inches for 6 months or more out of the year. Unless drained, this soil will be ponded for a long time. The available water capacity is very high. Permeability is slow. Natural fertility and the organic matter content are high.

The natural vegetation consists of swamp oak, swamp maple, cypress, grasses, vines, and forbs. In some areas it consists of prairie growth of sawgrass, pickerelweed, various weeds and grasses, and scattered swamp maple. Most areas are used for timber or as range. Some areas are used for truck crops.

The small areas of this soil that are within the larger areas of Bradenton or Chobee soils are used for growing vegetables. Because this soil is in a low position, vegetables may be damaged by high water. Even if ditches are placed at close intervals, drainage is slow because of the fine texture of the surface layer and subsoil. Fertility is very high. If the soil is properly drained and well managed, excellent yields of truck crops, especially of leafy vegetables, can be obtained.

This soil is not suited to cultivated crops or to use as improved pasture in areas where adequate outlets for artificial drainage systems are not available.

This soil generally is not used for pine tree production. With adequate surface drainage, however, the potential productivity is high. Equipment limitations and seedling mortality are the main management concerns. Slash pine is better for planting than other trees.

This soil is in capability subclass VIw. It is not assigned to a range site.

15—Delray mucky loamy fine sand. This is a very poorly drained, nearly level soil in shallow depressions in flatwoods. Individual areas are irregularly shaped. Slopes are 0 to 2 percent.

Typically, the surface layer is black. In the upper part it is mucky loamy fine sand 8 inches thick. In the lower part it is loamy fine sand 8 inches thick. A thin layer of muck and litter on the surface is common. The subsurface layer is fine sand. The upper 5 inches is grayish brown, the next 22 inches is light brownish gray, and the lower 5 inches is grayish brown. The subsoil in the upper 3 inches is grayish brown fine sandy loam. In the next 15 inches it is grayish brown sandy clay loam. In the next 9 inches it is greenish gray sandy clay loam. Below that, to a depth of 80 inches or more it is grayish brown sandy clay loam.

Included with this soil in mapping are small areas of Felda, Floridana, Manatee, and Chobee soils.

In most years, if this soil is not drained, a water table is generally at or slightly above the surface for 6 months or more out of the year. The available water capacity is high in the surface layer, medium in the subsoil, and low in the subsurface layer. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil. Natural fertility is medium.

The natural vegetation in some places is maidencane and sawgrass in dense stands. In other places it is bay, sweetgum, and maple.

This soil is well suited to many locally important crops if a well designed and maintained water control system removes excess water rapidly during heavy rains. Other important management practices include seedbed preparation, crop rotations, and fertilization. Cover crops should be rotated with row crops and should be on the soil two-thirds of the time. Crop residue and cover crops help protect the soil from erosion.

With intensive water control, this soil is moderately suited to citrus except in areas that are subject to cold damage. The trees should be planted in beds, and close growing vegetation is necessary between the trees. Regular use of fertilizer is needed.

This soil is too wet for most improved pasture grasses and legumes. With adequate water control, it is well suited to pangolagrass, bahiagrass, and clover. These plants grow well if the soil is properly fertilized and limed. Controlled grazing helps maintain plant vigor for best yields.

The potential productivity for pine trees is moderately high if a water control system removes excess surface water. Equipment use and seedling mortality are management concerns. Slash pine is the best tree to plant.

This Delray soil is in capability subclass IIIw and in the Freshwater Marsh and Ponds range site.

16—Delray complex. This complex consists of several nearly level, very poorly drained soils on flats and in sloughs that are moderately broad, low, and grassy. The soils are so intermixed that they could not be shown separately at the scale selected for mapping.

Delray soils make up about 45 percent of this complex, and similar soils make up 30 percent. In some of the similar soils, the surface layer is slightly thinner and darker colored than typical for Delray soils, and in others an organically stained layer is between the surface layer and the subsoil. Scattered areas of Anclote, Felda, Floridana, Ona, and Gator soils make up about 25 percent.

Typically, the surface layer of Delray soils is black fine sand 15 inches thick. The subsurface layer is grayish brown and light brownish gray fine sand to a depth of about 55 inches. The subsoil is grayish brown and

greenish gray fine sandy loam and sandy clay loam to a depth of 80 inches or more.

In most years, if these Delray soils and the similar soils are not drained, a water table is at or near the soil surface for 6 months or more out of the year. The available water capacity is high in the surface layer, medium in the subsoil, and low in the subsurface layer. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil. Natural fertility is medium.

The natural vegetation consists mainly of water-tolerant grasses such as bluestem, lopsided indiangrass, maidencane, and pineland threeawn. In some places it also consists of waxmyrtle and widely spaced gum and cypress.

These soils are well suited to many locally important crops if a well designed and maintained water control system removes excess water rapidly during heavy rains. Other important management practices include seedbed preparation, crop rotations, and fertilizer. Cover crops should be rotated with row crops and should be on the soil two-thirds of the time. Crop residue and cover crops help protect the soil from erosion.

These soils are not suitable for citrus unless they are drained. With intensive water control, these soils are moderately suited to citrus, except in areas that are subject to cold damage. The trees should be planted in beds, and close growing vegetation is necessary between the trees. Regular use of fertilizer is needed.

These soils are too wet for most improved pasture grasses and legumes. If simple drainage measures are used to remove excess surface water, the soils are well suited to pangolagrass, bahiagrass, and clover. These plants grow well if the soils are properly fertilized and limed. Controlled grazing helps maintain plant vigor for best yields.

The potential productivity is moderately high for pine trees if a water control system is installed to remove excess surface water before the trees are planted. Equipment limitations and seedling mortality are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIw and in the Slough range site.

17—Delray-EauGallie complex. This complex consists of soils in nearly level, broad grassy sloughs that have poorly defined stream channels in some places. Some areas are located around the larger ponds. The soils are in the western part of the county, generally at an elevation of less than 40 feet. The soils are so intermixed that they could not be mapped separately at the scale selected for mapping. Slopes are less than 2 percent.

Delray soils make up about 45 percent of this complex, EauGallie soils make up 35 percent, and scattered areas of Anclote, Felda, Floridana, and Wabasso soils make up 20 percent. Typically, Delray soils are at a slightly lower elevation than EauGallie soils.

Typically, the surface layer of Delray soils is black fine sand about 15 inches thick. The subsurface layer is grayish brown and light brownish gray fine sand about 40 inches thick. The subsoil is grayish brown and greenish gray fine sandy loam and sandy clay loam to a depth of 80 inches or more.

In most years, if Delray soils are not drained, a water table is at or near the soil surface for 6 months or more out of the year. The available water capacity is high in the surface layer, medium in the subsoil, and low in the subsurface layer. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil. Natural fertility is medium.

Typically, the surface layer of EauGallie soils is dark gray fine sand about 4 inches thick. The subsurface layer is light gray fine sand 9 inches thick. The subsoil in the upper part is dark reddish brown and dark brown fine sand. Below that, it is gray sand 5 inches thick. In the lower part it is gray fine sandy loam to a depth of 76 inches or more.

In most years, if EauGallie soils are not drained, the water table is within 10 inches of the surface for 2 to 4 months out of the year and within 40 inches of the surface for more than 6 months out of the year. Permeability is rapid and the available water capacity is very low in the surface layer, the subsurface layer, and the layer between the upper and lower parts of the subsoil. Permeability is moderately rapid to rapid and the available water capacity is low to medium in the subsoil.

The natural vegetation consists of scattered pine trees, clumps of sawpalmetto, gallberry, and a stand of grasses such as bluestem, lopsided indiangrass, maidencane, and pineland threeawn.

Because of wetness and poor soil quality, Delray soils have severe limitations and EauGallie soils have very severe limitations for cultivated crops. Without water control, only certain kinds of crops can be grown. Crops such as corn and soybeans can be grown if a water control system removes excess water rapidly after heavy rains. Other important management practices are seedbed preparation that includes bedding the rows and fertilizing, liming, and a crop rotation that keeps close growing, soil improving crops on the surface at least two-thirds of the time. Cover crops and residue from row crops help protect the soil from erosion.

With intensive water control, Delray soils are moderately suitable for citrus except in areas that are subject to cold damage. EauGallie soils are suited to citrus if the water table is maintained at a depth of about 4 feet. Planting the trees in beds helps lower the water table. Plant cover is necessary between the trees.

These soils are well suited to pasture and hay crops. In most places surface ditches are needed to remove excess surface water during heavy rains. Bahiagrass and

white clover are well adapted and grow well under good management. Fertilizer and lime are needed. Controlled grazing helps maintain vitality of the plants for highest yields.

The potential productivity for pine trees on these soils is moderately high if a water control system is installed to remove excess surface water before the trees are planted. Equipment limitations and seedling mortality are management concerns. Slash pine is the best tree to plant.

Delray soils are in capability subclass IIIw and in the Slough range site. EauGallie soils are in capability subclass IVw and in the South Florida Flatwoods range site.

18—Delray-Pomona complex. This complex consists of soils in nearly level, broad grassy sloughs where there are poorly defined stream channels in some places. Some areas are located around the larger ponds. The soils are in the eastern part of the county, generally above an elevation of about 40 feet. The soils are so intermixed that they could not be mapped separately at the scale selected for mapping. Slopes are less than 2 percent.

Delray soils make up about 50 percent of this complex, Pomona soils make up 40 percent, and scattered areas of Myakka, Wauchula, Waveland, and Palmetto soils make up 10 percent. Typically, the Delray soils are at slightly lower elevations than the Pomona soils.

Typically, the surface layer of Delray soils is black fine sand about 15 inches thick. The subsurface layer is grayish brown and light brownish gray fine sand 40 inches thick. The subsoil is grayish brown and greenish gray fine sandy loam and sandy clay loam to a depth of 80 inches or more.

In most years, if Delray soils are not drained, the water table is at or near the surface for 6 months or more out of the year. The available water capacity is high in the surface layer, medium in the subsoil, and low in the subsurface layer. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil. Natural fertility is medium.

Typically, the surface layer of Pomona soils is black fine sand about 6 inches thick. The subsurface layer is gray and light gray fine sand 16 inches thick. The subsoil in the upper part is dark reddish brown and dark brown fine sand 14 inches thick. Below that, there is pale brown fine sand 15 inches thick. The subsoil in the lower part is olive gray fine sandy loam 9 inches thick. The substratum is gray loamy fine sand to a depth of 80 inches.

In most years, if Pomona soils are not drained, the water table is at or near the soil surface for 5 months or more out of the year. The available water capacity is low in the surface layer, medium in both parts of the subsoil, and very low in the other layers. Permeability is moderately slow in the lower part of the subsoil, moderate in the upper part of the subsoil, and rapid in the other layers. Natural fertility is low.

The natural vegetation in areas of this complex consists of scattered pine trees, clumps of sawpalmetto, gallberry, and a stand of grasses such as bluestem, lopsided indiangrass, maidencane, and pineland threeawn.

Wetness and poor soil quality are severe limitations in Delray soils and very severe limitations in Pomona soils to use of these soils for cultivated crops. Without water control, only certain kinds of crops can be grown. Crops such as corn and soybeans can be grown if a water control system removes excess water rapidly after heavy rains. Seedbed preparation should include bedding the rows. Other important management practices include fertilizing, liming, and crop rotations that keep close growing, soil improving crops on the surface at least two-thirds of the time. Cover crops and residue from row crops help protect the soils from erosion.

With intensive water control, Delray soils are moderately suited to citrus except in areas that are subject to cold damage. Without water control, Pomona soils are poorly suited. The water table in both soils should be maintained at a depth of about 4 feet. Planting the trees in beds helps lower the water table. A cover of vegetation is necessary between the trees.

The soils in this complex are well suited to pasture and hay crops. In most places surface ditches help remove excess surface water during heavy rains. Tall fescuegrass, bahiagrass, and white clover are well adapted and grow well under good management. Fertilizer and lime are needed. Controlled grazing helps maintain plant vitality for highest yields.

The potential productivity for pine trees on these soils is moderately high if a water control system is installed to remove excess surface water before the trees are planted. Equipment limitations and seedling mortality are management concerns. Slash pine is the best tree to plant.

Delray soils are in capability subclass IIIw and in the Slough range site. Pomona soils are in capability subclass IVw and in the South Florida Flatwoods range site.

19—Duette fine sand, 0 to 5 percent slopes. This is a moderately well drained soil on low ridges and knolls in flatwoods. Slopes are smooth.

Typically, the surface layer is very dark gray fine sand about 4 inches thick. The subsurface layer, to a depth of 58 inches, is fine sand. In the upper 8 inches it is light gray, and below that it is white. The subsoil is fine sand that is coated with organic material to a depth of 80 inches or more. To a depth of 64 inches, it is dark brown, and below that, it is black.

Included with this soil in mapping are small areas of Cassia and Pomello soils.

In most years, if this Duette soil is not drained, the water table is at a depth of 48 to 72 inches for 1 to 4 months during the wet season. It is below a depth of 72 inches for the rest of the year. The available water capacity is very low, except in the subsoil where it is medium. Natural fertility is low. Permeability is very rapid in the surface layer and moderately rapid in the subsoil.

The natural vegetation consists of dwarf and scrub oak, sawpalmetto, sand pine, pricklypear, and pineland threeawn.

This soil is not suitable for most commonly cultivated crops. It is poorly suited to citrus. Only fair yields can be obtained under a high level of management. Sprinkler irrigation is needed for best yields. Fertilizer and lime are also needed.

This soil is only fairly suitable for improved pasture grasses even if good management practices are used. Bahiagrass is better adapted than other grasses. Clovers are not suited. Droughtiness is the major limitation except during the wet season. Fertilizer and lime are needed. Controlled grazing helps permit vigorous growth for highest yields and helps provide good ground cover.

The potential productivity for pine trees is moderate. Seedling mortality, plant competition, and equipment mobility are the major management problems. Sand pine is the best tree to plant.

This soil is in capability subclass VIs and in the Sand Pine Scrub range site.

20—EauGallie fine sand. This is a nearly level, poorly drained soil in broad areas of flatwoods. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand 5 inches thick. The subsurface layer is grayish brown and light brownish gray fine sand to a depth of about 28 inches. The subsoil in the upper part is black fine sand that is coated with organic matter to a depth of 42 inches. In the lower part it is grayish brown sandy clay loam to a depth of 50 inches. The substratum is grayish brown fine sand, loamy fine sand, and fine sandy loam to a depth of 65 inches.

Included with this soil in mapping are small areas of Delray, Pinellas, and Wabasso soils. Also included are soils that are similar to the EauGallie soils except that they are yellowish or brownish in the subsurface layer and are in scattered wet depressions.

In most years, a water table is at a depth of less than 10 inches for 2 to 4 months during wet seasons and within a depth of 40 inches for more than 6 months out of the year. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in

Figure 5.—If the excess water is controlled, EauGallie fine sand is well suited to tomatoes and other vegetable crops.

the subsoil and substratum. The available water capacity is very low in the surface and subsurface layers, low to medium in the subsoil, and low in the substratum. Organic matter content and natural fertility are low.

The natural vegetation is slash pine, sawpalmetto, waxmyrtle, gallberry, and pineland threeawn in open forest and bluestem, panicum, and other grasses.

Wetness and sandy texture in the root zone are very severe limitations to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless very intensive management practices are followed. This soil is well suited to a number of vegetable crops if a water control system removes excess water in wet seasons and distributes water through subsurface irrigation in dry seasons (fig. 5). Row crops should be rotated with close growing, soil improving crops. Seedbed preparation should include bedding of the rows. Fertilizer and lime should be added according to the needs of the crops.

This soil is suitable for citrus only if a carefully designed water control system maintains the water table at a depth of more than 4 feet. Planting the trees in beds helps lower the effective depth of the water table. A vegetative cover should be maintained between the trees. Regular applications of fertilizer and lime are needed.

If well managed, this soil is well suited to pangolagrass, improved bahiagrass, and white clover. In some areas it is used as improved pasture. Water control measures are needed to remove excess surface water after heavy rains. Regular applications of fertilizer and lime are needed. Controlled grazing helps prevent weakening of the plants.

This soil has moderate potential productivity for pine trees. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IVw and in the South Florida Flatwoods range site.

21—Estero muck. This is a nearly level soil in tidal mangrove swamps. It is very poorly drained. Slopes are smooth and range from 0 to 1 percent.

Typically, the surface layer is 14 inches thick. In the uppermost 6 inches it is black muck, and below that it is black and very dark gray fine sand. The subsurface layer is light brownish gray and grayish brown fine sand 17 inches thick. The subsoil extends to a depth of 56 inches. It is black, dark reddish brown, and dark brown fine sand. The substratum to a depth of 80 inches or more is grayish brown fine sand.

Included with this soil in mapping are small areas of Canaveral, Kesson, Myakka, and Wulfert soils.

Estero muck is very poorly drained. The areas are flooded daily by high tides. Permeability is moderately rapid in the subsoil and rapid in the other layers. The available water capacity is high in the layer of muck, medium in the lower part of the surface layer and in the subsoil, and low or very low in the subsurface layer and in the substratum.

The natural vegetation is dominantly a thick stand of black mangrove, but in some places it includes seashore saltgrass, batis, and oxeye daisy.

This soil is not suitable for cultivated crops, citrus, or pasture or for use as woodland.

This soil is in capability subclass VIIw. It is not assigned to a range site.

22—Felda fine sand. This is a nearly level, poorly drained soil on low hammocks. Slopes are generally smooth and range from 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand about 3 inches thick. The subsurface layer is grayish brown fine sand 21 inches thick. It is mottled with gray and brown. The subsoil is 40 inches thick. It is mottled with brown and yellow. The upper 3 inches is grayish brown fine sandy loam, the next 6 inches is gray sandy clay loam, and the lower 29 inches is light gray sandy clay loam. Below the subsoil there is light gray sandy loam to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Bradenton soils.

In most years, if this Felda soil is not drained, the water table is within a depth of 10 inches for 2 to 4 months out of the year and at a depth of 10 to 40 inches for about 6 months out of the year. It recedes to a depth of more than 40 inches in dry seasons. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil.

The natural vegetation consists of live oak, cabbage palm, slash pine, pineland threeawn, and bluestem. In many areas the soil is used for vegetables. Most areas in natural vegetation are used as range.

Wetness is a severe limitation to use of this soil for cultivated crops. The soil is suitable for many fruit and vegetable crops if a complete water control system removes excess surface and internal water rapidly. The system should also distribute water for subsurface irrigation. Other management practices are seedbed preparation, fertilizing, and crop rotations that keep the soil in a close growing crop at least two-thirds of the time. Cover crops and all other crop residue should be used to protect the soil from erosion.

This soil is well suited to citrus if a water control system maintains drainage to a depth of about 4 feet. In many areas it is used for citrus. Bedding and planting the trees in the beds help provide surface drainage. Close growing vegetation maintained between the trees helps protect the soil from blowing in dry weather. Fertilizer is required.

This soil is well suited to pangolagrass, bahiagrass, and clover. In many areas it is used as improved pasture. Pastures of grass or a grass-clover mixture can

be grown under good management. Regular applications of fertilizers and controlled grazing are required for highest yields.

The potential productivity for pine trees is moderately high. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIw and in the Slough range site.

23—Felda-Palmetto complex. This complex consists of soils in broad sloughs where stream channels are poorly defined and soils around some of the larger ponds in the eastern and central parts of the county. Felda and Palmetto soils are so intricately mixed that they could not be mapped separately at the scale selected for mapping. Slopes are less than 2 percent.

Felda soils make up about 40 percent of the complex, Palmetto soils and some similar soils make up 35 percent, and minor soils make up 25 percent.

Typically, the surface layer of Felda soils is very dark gray fine sand about 3 inches thick. The subsurface layer is grayish brown fine sand 21 inches thick. The subsoil in the upper part is grayish brown fine sandy loam 3 inches thick, in the middle part it is gray sandy clay loam 6 inches thick, and in the lower part it is light gray sandy clay loam 29 inches thick. The substratum is at a depth of about 62 inches and is light gray sandy loam.

Felda soils are poorly drained. In most years, if the soils are not drained, the water table is within a depth of 10 inches for 2 to 4 months out of the year and at a depth of 10 to 40 inches for about 6 months out of the year. It recedes to below a depth of 40 inches in dry seasons. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil.

Typically, the surface layer of Palmetto soils is black sand about 8 inches thick. The subsurface layer is dark gray or gray sand to a depth of 25 inches. The subsoil is dark grayish brown and very dark grayish brown sand to a depth of about 45 inches. It is grayish brown and dark grayish brown sandy clay loam and sandy loam to a depth of about 64 inches and dark grayish brown loamy sand to a depth of 68 inches. The soils that are similar to Palmetto soils have a thicker, dark colored surface layer.

Palmetto soils are poorly drained. In most years, if the soils are not drained, the water table is within 10 inches of the surface for 2 to 6 months out of the year. In some areas water stands on the surface briefly after heavy rainfall. Permeability is rapid in the surface and subsurface layers and moderately slow in the subsoil. The available water capacity is low to medium in the surface and subsurface layers and medium in the subsoil.

The most common minor soils included in the complex are the Myakka, Delray, and Floridana soils.

The natural vegetation in areas of this complex consists of slash pine, water and live oak, sawpalmetto, running oak, gallberry, and pineland threeawn.

Wetness and low fertility are severe limitations in Felda soils and very severe limitations in Palmetto soils to use of these soils for cultivated crops. Only certain kinds of crops can be grown unless very intensive management practices are followed. These soils are well suited to a number of vegetable crops if a water control system removes excess water in wet seasons and distributes water for subsurface irrigation in dry seasons. Row crops should be rotated with close growing, soil improving crops. The soil improving crops should be on the soil three-fourths of the time. Crop residue and cover crops help protect the soil from erosion. Seedbed preparation should include bedding of the rows. Fertilizer and lime are needed.

These soils are suitable for citrus only if a carefully designed water control system maintains the water table below a depth of 4 feet. The trees should be planted in beds to help lower the water table, and a vegetative cover is necessary between the trees. Fertilizer and lime are needed.

These soils are well suited to pasture and are used as improved pasture in many areas. Pangolagrass, improved bahiagrass, and white clover grow well if the soils are well managed. Water control measures are needed to remove excess surface water after heavy rains. Fertilizer and lime are needed. Controlled grazing helps prevent weakening of the plants.

Felda soils have moderately high potential productivity and Palmetto soils have moderate potential productivity for pine trees, but a water control system is needed for each soil to reach its potential. Equipment limitations and seedling mortality are the main management concerns. Slash pine is the best tree to plant, but only where water control is adequate.

Felda soils are in capability subclass IIIw, and Palmetto soils are in subclass IVw. Both soils are in the Oak Hammock range site.

24—Felda-Wabasso association, frequently flooded. This association consists of nearly level, poorly drained Felda soils and Wabasso soils and soils that are closely similar to them. The soils are in a regular and repeating pattern on the flood plains along the larger streams in the county. The Wabasso soils are on low ridges. The Felda soils are at slightly lower elevations. Slopes are 0 to 2 percent. Areas are generally narrow and long and follow streambeds and flood plains. Some areas are broad and range in width to almost 2 miles. Areas of the individual soils are large enough to map

separately, but in considering the present and predicted use they were mapped as one unit.

The composition of this map unit is more variable than that of most other map units in the county; nevertheless, valid interpretations for the expected uses of the soils can still be made.

Felda soils and those that are closely similar to them make up about 60 percent of the association, Wabasso soils and those that are closely similar to them make up 25 percent, and minor soils make up 15 percent.

Typically, the surface layer of Felda soils is very dark gray fine sand 3 inches thick. The subsurface layer is grayish brown fine sand 21 inches thick. The subsoil is between depths of 24 and 64 inches. In the upper part it is grayish brown fine sandy loam 3 inches thick. In the middle part it is gray sandy clay loam 6 inches thick. In the lower part it is light gray sandy clay loam 29 inches thick. The substratum to a depth of 80 inches or more is light gray sandy loam. In some of the closely similar soils the subsoil is nearer the surface and in others the surface layer is thicker than in Felda soils.

In most years, if Felda soils are not drained, the water table is within a depth of 10 inches for 2 to 4 months out of the year and at a depth of 10 to 40 inches for about 6 months out of the year. It recedes to below a depth of 70 inches in dry seasons. Stream overflow frequently floods these soils. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil.

Typically, Wabasso soils have a surface layer of very dark gray fine sand 7 inches thick. The subsurface layer is gray and light gray fine sand 14 inches thick. The subsoil in the upper part is black, dark reddish brown, and brown fine sand 10 inches thick. In the lower part it is grayish brown sandy loam and gray sandy clay loam 28 inches thick. A 6-inch layer of pale brown fine sand separates the two parts. The substratum to a depth of 80 inches or more is gray sand mixed with shell fragments. The closely similar soils are like Wabasso soils except that they do not have the lower part of the subsoil.

In most years, if Wabasso soils are not drained, the water table is at a depth of 10 to 40 inches for more than 6 months out of the year and within a depth of 10 inches for less than 60 days in wet seasons. Stream overflow frequently floods these soils.

Permeability is rapid in the surface and subsurface layers, in the layer between the two parts of the subsoil, and in the substratum. It is moderate to moderately rapid in the upper part of the subsoil and slow to very slow in the lower part. The available water capacity is very low in the surface and subsurface layers and in the layer between the two parts of the subsoil. It is medium in the upper and lower parts of the subsoil.

The most extensive soils included in the association are the Anclote, Floridana, Bradenton, and Chobee soils.

The natural vegetation consists mostly of gum, oak, maple, hickory, bay, and magnolia in the lower areas and scattered pine and sawpalmetto on the low ridges. In a few places it consists of water-tolerant grasses. Almost all areas of this unit are in natural vegetation.

These soils are not suited to crops. They are moderately well suited to use as improved pasture. Flooding and wetness, the major limitations, are difficult to overcome. If the soils are drained and well managed, pasture of good quality can be grown.

These soils are not suitable for citrus.

The potential productivity for pine trees is moderately high if water control is provided. Equipment limitations and seedling mortality are the main management concerns. Slash pine is the best tree to plant.

These soils are in capability subclass Vw. They are not assigned to a range site.

25—Floridana fine sand. This is a nearly level, very poorly drained soil in low flats that have been drained by ditches and channels in many places. Slopes are smooth to concave and are less than 2 percent.

Typically, the surface layer is about 15 inches thick. In the upper part it is black fine sand 4 inches thick, and in the lower part it is very dark gray fine sand 11 inches thick. The subsurface layer is gray fine sand 17 inches thick. The subsoil is dark gray sandy clay loam to a depth of 44 inches and gray sandy loam to a depth of 65 inches. The substratum is light gray fine sand to a depth of 80 inches or more.

Included with this soil in mapping are areas of Delray and Felda soils and a few areas of organic soils.

In most years, if this Floridana soil is not drained, the water table is at a depth of less than 10 inches for about 6 months out of the year. Permeability is rapid in the surface and subsurface layers and slow in the subsoil. The available water capacity is medium in the surface layer and subsoil and low in the subsurface layer.

The natural vegetation consists of cattails and dense stands of maidencane and sawgrass. Most areas are used for vegetables. Many areas are in improved pasture.

This soil is too wet for cultivated crops. If a well designed and maintained water control system removes excess water during heavy rains, the soil is well suited to many locally important crops. Additional management practices include seedbed preparation, crop rotation, and regular applications of fertilizer and lime. Cover crops should be rotated with row crops and should be on the soil two-thirds of the time.

This soil is not suitable for citrus.

This soil is too wet for most improved pasture grasses and legumes. If simple drainage measures remove excess surface water after heavy rains, the soil is well suited to many grasses and legumes. Pangolagrass,

bahiagrass, and clover grow well if the soil is adequately fertilized and limed. Controlled grazing helps maintain plant vigor for best yields.

This soil generally is not used for pine tree production. With adequate surface drainage the potential productivity for pine trees is high. The main management concerns are equipment limitations and seedling mortality. Slash pine and South Florida slash pine are the best trees to plant.

This soil is in capability subclass IIIw and in the Freshwater Marsh and Ponds range site.

26—Floridana-Immokalee-Okeelanta association. This map unit consists of nearly level, very poorly drained Floridana soils, poorly drained Immokalee soils, and very poorly drained Okeelanta soils. It is about 35 percent Floridana soils, 30 percent Immokalee soils, 20 percent Okeelanta soils, and 15 percent minor soils. These soils are in small to large shallow grassy ponds mainly in the central and eastern parts of the county. Generally, Okeelanta soils are in the lowest places near the center of the ponds; Floridana soils are in an intermediate position; and Immokalee soils are along the edges of ponds. Slopes are less than 2 percent. Areas of the individual soils are large enough to map separately, but in considering the present and predicted use they were mapped as one unit. Most of the mapped areas are circular or oblong.

The composition of this map unit is more variable than that of most other map units in the county; nevertheless, valid interpretations for expected uses of the soil can still be made.

Typically, the surface layer of Floridana soils is black and very dark gray fine sand about 19 inches thick. The subsurface layer is gray fine sand about 17 inches thick. The subsoil is dark gray sandy clay loam 17 inches thick. The substratum is light gray fine sand that extends to a depth of 80 inches or more.

In most years, in undrained areas Floridana soils are ponded for 6 to 9 months or more out of the year. The water table is at a depth within 40 inches for the rest of the year except in extended dry periods. Permeability is rapid in the surface layer, subsurface layer, and substratum; it is slow in the subsoil. The available water capacity is medium in the surface layer and subsoil and low in the other layers.

Typically, the surface layer of Immokalee soils is black fine sand about 5 inches thick. The subsurface layer is dark gray, gray, and light gray fine sand 29 inches thick. The subsoil is dark reddish brown and dark brown fine sand 9 inches thick. The substratum to a depth of 80 inches or more is grayish brown fine sand.

Immokalee soils are ponded for 6 months or more in most years. The water table is at a depth within 40 inches for much of the remainder of the year. Permeability is moderate in the subsoil and rapid in all other layers. The available water capacity is medium in the subsoil, low in the surface layer, and very low in the other layers.

Typically, Okeelanta soils in the uppermost 20 inches are black muck. Below that, to a depth of 54 inches or more, there is black and light brownish gray sand.

In most years, in undrained areas Okeelanta soils are ponded for 9 months or more, and the water table is near the surface for the rest of the time. Permeability is rapid throughout the soil. The available water capacity is very high in the organic layer and low in the sandy layers.

Included with the soils in this map unit are areas of Anclote, Chobee, Delray, Manatee, Myakka, and Pomona soils.

The natural vegetation in the lowest places is sawgrass, maidencane, willow, and, in places, a few cypress. In other areas, the vegetation is maidencane, St.-Johnswort, various bluestems, smooth cordgrass, and sedges.

The soils are not suited to crops or improved pasture or to use as woodland. In many areas they are used as rangeland.

The soils are in capability subclass VIIw and in the Freshwater Marsh and Ponds range site.

27—Gator muck. This is a very poorly drained, nearly level soil in depressions. Most areas are on Terra Ceia Island. Slopes are 1 percent or less.

Typically, the surface layer is black muck about 18 inches thick. Below the surface layer there is light gray, dark grayish brown, and grayish brown sandy loam to a depth of 55 inches. Below that, there is grayish brown loamy sand to a depth of 72 inches and stratified layers of light gray sand and loamy sand to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Chobee, Bradenton, and Floridana soils. Also included are soils with sandy layers between the organic layers and the loamy substratum and soils where the organic material is less than 16 inches thick or more than 40 inches thick.

In undrained areas this Gator soil is ponded or the water table is within a depth of 10 inches except in extended dry seasons. The available water capacity is very high in the organic layers, medium in the loamy layers, and low in the underlying sandy material. Permeability is rapid in the organic layer and moderate in the loamy layer. Natural fertility is medium to high.

In some areas this soil is used for vegetables and pasture. In other areas the natural vegetation consists of willows, red maple, sawgrass, pickerelweed, sedges, ferns, maidencane, and other water-tolerant grasses.

This soil is well suited to most vegetable crops if a well designed and maintained water control system removes excess water when the soil is in crops. The system should also keep the soil saturated at all other times. Water tolerant cover crops should be on the soil

when it is not in crops. Crop residue and cover crops help protect the soil from erosion. This soil is not suitable for citrus.

Pangolagrass, bahiagrass, and white clover grow well if a water control system maintains the water table near the surface to prevent excessive oxidation of the organic layer. Controlled grazing should be used for maximum yields.

This soil is not suitable for pine trees.

This soil is in capability subclass VIIw and in the Freshwater Marsh and Ponds range site.

28—Hallandale fine sand. This is a nearly level, poorly drained sandy soil that overlies limestone. The depth to limestone varies from 7 to 20 inches within short distances. This soil is on low flats that generally border ponds and swamps. Slopes are smooth to concave and are less than 2 percent.

Typically, the surface layer is dark gray sand about 6 inches thick. The underlying material is very pale brown sand overlying hard, fractured limestone boulders at a depth of about 15 inches. The limestone is at a depth of more than 20 inches in solution holes and in fractures between boulders.

Included with this soil in mapping are small areas of the Broward Variant, Parkwood Variant, and Wabasso soils. Rock outcrops are common, particularly near the rim of ponds and depressions. A symbol on the soil maps indicates exposed rock.

In most years, if this soil is not drained, the water table is within 10 inches of the surface for 4 to 6 months out of the year and at a depth of 10 to 30 inches the rest of the year, except during extremely dry periods.

Permeability is rapid in all layers. The available water capacity is medium in the surface layer and low in the underlying material. The content of organic matter and natural fertility are low.

The natural vegetation consists of slash pine, a few live oak, sawpalmetto, cabbage palm, inkberry, scattered cypress, southern bayberry, pineland threeawn, and a wide variety of other grasses. Most areas are in native vegetation and are used as range. Some areas are used for truck crops.

Wetness, shallow depth, and low available water capacity are very severe limitations to use of this soil for cultivated crops. This soil is suitable for a number of vegetable crops if a water control system removes excess water in wet seasons and distributes water for subsurface irrigation in dry seasons. The limestone near the surface makes construction of such a system difficult. Row crops should be rotated with close growing, soil improving crops. The rotation should keep soil improving crops on the soil three-fourths of the time. Seedbed preparation should include bedding of the rows. Fertilizer and lime should be added according to the needs of the crop.

The soil is poorly suited to citrus without very intensive management. In areas that are relatively free from freezing temperatures, the soil is suitable for citrus if a carefully designed water control system maintains the water table below a depth of 4 feet. The trees should be planted in beds, and a vegetative cover is necessary between the trees. Regular applications of fertilizers and lime are needed.

If well managed, this soil is well suited to pangolagrass, improved bahiagrass, and white clover. Water control measures are needed to remove excess surface water after heavy rains. Regular applications of fertilizer and lime are needed. Controlled grazing helps prevent weakening of the plants.

The potential productivity for pine trees is high. South Florida slash pine is better for planting than other trees. Equipment limitations, seedling mortality, and plant competition are the main management concerns.

This soil is in capability subclass IV and in the Cabbage Palm Flatwoods range site.

29—Manatee mucky loamy fine sand. This is a nearly level, very poorly drained soil in drained depressions. Areas are irregular in shape. Slopes are less than 2 percent.

Typically, the surface layer is black mucky loamy fine sand to a depth of 8 inches and loamy fine sand to a depth of 13 inches. The upper part of the subsoil is very dark gray fine sandy loam 12 inches thick, the middle part is dark gray fine sandy loam 9 inches thick, and the lower part is dark gray loamy fine sand 18 inches thick. The substratum to a depth of 80 inches or more is dark gray fine sand with yellowish red mottles.

Included with this soil in mapping are areas of Chobee and Floridana soils. Also included are small areas of a soil that is similar to Manatee soils except that it has a surface layer of muck or fine sand. Also included are small areas of Manatee soils in depressions that are not adequately drained and are subject to ponding for several months of the year.

In most years, a water table is within 10 inches of the surface for 2 to 4 months out of the year. Permeability is moderate in the surface layer and in the subsoil. Natural fertility and organic matter content are high. The available water capacity is high in the surface layer and medium in the other layers.

The natural vegetation consists of pickerelweed, sedge, maidencane, Jamaica sawgrass, broomsedge bluestem, panicum, cinnamon fern, and other perennial grasses.

This soil is well suited to many crops if a well designed and maintained water control system removes excess water rapidly during heavy rains. Other management practices include seedbed preparation, crop rotations, and regular applications of fertilizer. Soil improving cover crops should be rotated with row crops. They should be on the soil at least two-thirds of the time.

This soil is moderately suited to citrus if a water control system maintains soil aeration to a depth of about 4 feet. The trees should be planted in beds. Close growing vegetation between the trees helps prevent blowing and washing. Regular applications of fertilizers are required.

This soil is too wet for most improved pasture grasses. It is well suited to several improved grasses and legumes if simple drainage measures remove excess water after rains. High yields of pangolagrass, bahiagrass, and white clover can be obtained with adequate fertilizing and liming. Controlled grazing helps maintain plant vigor for best yields.

The potential productivity for pine trees is high if the excess water is drained. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant after excess water has been removed.

Figure 6.—Grass-clover pasture on Myakka fine sand, 0 to 2 percent slopes. Water control measures are needed after heavy rains.

This soil is in capability subclass IIIw and in the Freshwater Marsh and Ponds range site.

30—Myakka fine sand, 0 to 2 percent slopes. This is a nearly level, poorly drained soil in areas of broad flatwoods. Slopes are smooth to concave.

Typically, the surface layer is dark gray fine sand about 5 inches thick. The subsurface layer is fine sand. In the upper 8 inches it is gray, and below that, it is light gray. The subsoil is fine sand 22 inches thick. In the upper 6 inches it is black, in the next 8 inches it is dark reddish brown, and in the lower 8 inches it is dark brown. Below the subsoil there is brown fine sand to a depth of 61 inches, and below that, there is very dark brown fine sand to a depth of 75 inches or more.

Included with this soil in mapping are small areas of EauGallie, Ona, Pomona, St. Johns, Wabasso, Wauchula, and Waveland soils.

In most years, the water table is at a depth of less than 10 inches for 1 to 4 months out of the year. It recedes to a depth of more than 40 inches in very dry seasons. The available water capacity is medium in the subsoil and very low in the other layers. Permeability is rapid in the surface and subsurface layers and substratum and moderate or moderately rapid in the subsoil. Internal drainage is slow, and runoff is slow. Natural fertility is low.

The natural vegetation consists of longleaf and slash pines and an undergrowth of sawpalmetto, running oak, gallberry, waxmyrtle, huckleberry, pineland threeawn, and scattered fetter bushes. Many areas are used as rangeland and improved pasture and for vegetables.

Wetness and sandy texture are very severe limitations to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless very intensive management practices are followed. The soil is suitable for vegetable crops if a water control system removes excess water in wet seasons and distributes water for subsurface irrigation in dry seasons. Crop residue and cover crops help protect the soil from erosion. Seedbed preparation should include bedding of the rows.

The soil is suitable for citrus if a carefully designed water control system maintains the water table below a depth of 4 feet. The trees should be planted in beds to help lower the water table, and a vegetative cover is necessary between the trees.

If well managed, this soil is well suited to pangolagrass, improved bahiagrass, and white clover (fig. 6). Water control measures are needed to remove excess surface water after heavy rains. Regular applications of fertilizer and lime are needed. Controlled grazing helps prevent weakening of the plants.

The potential productivity for pine trees is moderate. Slash pine is the best tree to plant. The main management problems are equipment limitations during periods of heavy rainfall, seedling mortality, and plant competition. A water control system to remove excess surface water is needed for highest yields.

This soil is in capability subclass IVw and in the South Florida Flatwoods range site.

31—Myakka fine sand, 2 to 5 percent slopes. This is a gently sloping, poorly drained soil in areas of flatwoods along many of the main drainage channels in the county.

Typically, the surface layer is black fine sand about 6 inches thick. The subsurface layer is gray fine sand about 6 inches thick. The subsoil in the upper part is very dark brown fine sand about 21 inches thick. The next layer is brown fine sand 28 inches thick. The subsoil in the lower part is very dark brown fine sand to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Ona, Pomona, St. Johns, and Wauchula soils and areas of soils that have a less well developed subsoil.

In most years, the water table is at a depth of less than 10 inches for 1 to 4 months out of the year. It recedes to a depth of more than 40 inches in very dry seasons. The available water capacity is medium in the subsoil and very low in the other layers. Permeability is rapid in the surface and subsurface layers and substratum and moderate or moderately rapid in the subsoil. Internal drainage is slow and runoff is slow to moderate. Natural fertility is low.

The natural vegetation consists of longleaf and slash pines and an undergrowth of sawpalmetto, running oak, gallberry, waxmyrtle, huckleberry, pineland threeawn, and scattered fetter bushes. In most areas the soils are used as forest or range.

Wetness, sandy texture, and a slight hazard of erosion are very severe limitations to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless very intensive management practices are followed. The soil is suitable for a number of vegetable crops if a water control system removes excess water in wet seasons and distributes water for subsurface irrigation in dry seasons. Crop residue and cover crops help protect the soil from erosion. Seedbed preparation should include bedding the rows.

The soil is suitable for citrus only if a carefully designed water control system maintains the water table below a depth of 4 feet. Trees should be planted in beds to help lower the water table, and a vegetative cover is necessary between the trees.

If well managed, this soil is well suited to pangolagrass, improved bahiagrass, and white clover. Water control measures help remove excess surface water after heavy rains. Fertilizer and lime are needed. Controlled grazing helps prevent weakening of the plants.

The potential productivity for pine trees is moderate. Slash pine is the best tree to plant. The main management problems are equipment limitations during

periods of heavy rainfall, seedling mortality, and plant competition. A water control system to remove excess surface water is needed for highest yields.

This soil is in capability subclass IVw and in the South Florida Flatwoods range site.

32—Myakka fine sand, shell substratum. This is a nearly level, poorly drained soil in areas of flatwoods mainly on Anna Marie and Longboat Keys. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is a mixture of gray, very dark gray, and grayish brown fine sand about 15 inches thick. The original surface layer and part of the subsurface layer have been mixed by machinery. The subsurface layer is fine sand 11 inches thick. In the upper 4 inches it is dark gray, and below that, it is light gray. The subsoil is fine sand 15 inches thick. It is weakly cemented in a few places. In the upper 3 inches it is black, and below that, it is dark brown. The substratum to a depth of 80 inches or more is dark yellowish brown and yellowish brown fine sand that is mixed with common to many shells and shell fragments.

Included with this soil in mapping are small areas of Canaveral soils and soils that are similar to Myakka soils except that the subsoil is weakly developed. Also included are a few areas where the original surface layer is covered by sandy and shelly fill material 20 inches thick.

In most years, if this soil is not drained, a water table is at a depth of less than 10 inches for 1 to 4 months out of the year. It recedes to a depth of more than 40 inches in very dry seasons. Most areas have been drained to some extent. The available water capacity is medium in the subsoil and very low in the other layers. Permeability is rapid in the surface and subsurface layers, very rapid in the substratum, and moderate or moderately rapid in the subsoil. Internal drainage is slow, and runoff is slow. Natural fertility is low.

The natural vegetation consists of longleaf and slash pine and an undergrowth of sawpalmetto, running oak, cabbage palm, waxmyrtle, and pineland threeawn.

This soil is mainly in urban uses, which preclude the use of this soil for agriculture or as woodland. Nevertheless, wetness and sandy texture are very severe limitations to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless intensive management practices are followed. The soil is suitable for a number of vegetable crops if a water control system removes excess water in wet seasons and distributes water for subsurface irrigation in dry seasons. Crop residue and cover crops help protect the soil from erosion. Seedbed preparation should include bedding the rows.

The soil is suitable for citrus only if a carefully designed water control system maintains the water table below a depth of 4 feet. Planting the trees in beds helps lower the water table. A vegetative cover is necessary between the trees to help reduce erosion.

If well managed, this soil is well suited to pangolagrass, improved bahiagrass, and white clover. Water control measures are needed to remove excess surface water after heavy rains. Fertilizer and lime are needed. Controlled grazing helps prevent weakening of the plants.

The potential productivity for pine trees is moderate. Slash pine is the best tree to plant. The main management problems are equipment limitations during periods of heavy rainfall, seedling mortality, and plant competition. A water control system to remove excess surface water is needed for highest yields.

This soil is in capability subclass IVw. It is not assigned to a range site.

33—Myakka fine sand, tidal. This is a nearly level, very poorly drained soil in high-lying tidal marshes between the mangrove swamps and better drained upland soils. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is mixed very dark gray and light gray fine sand about 3 inches thick. The subsurface layer is fine sand 12 inches thick. In the upper 4 inches it is gray, and below that, it is mixed gray and very dark gray. The subsoil is black fine sand 22 inches thick. The substratum is dark grayish brown, brown, and pale brown fine sand to a depth of 75 inches or more.

Included with this soil in mapping are small areas of Wulfert, Kesson, and Myakka soils. Also included are a few areas of soils that are underlain by limestone.

The water table fluctuates with the tide. It is at a depth of less than 10 inches for most of the year except where the soil is artificially drained or diked. The soil is frequently flooded during storms or after heavy rains. The available water capacity is medium in the subsoil and very low in the other layers. Permeability is rapid in the surface and subsurface layers and substratum and moderate or moderately rapid in the subsoil. Internal drainage is slow, and runoff is slow. Natural fertility is low.

In most areas, the native vegetation consists of sparse stands of pines, mangrove, needlerush, and sawgrass. In some areas, Brazilian pepper is common. In many areas, there is no vegetation.

This soil is not suitable for cultivated crops or citrus or for use as woodland.

This soil is in capability subclass VIIIw. It is not assigned to a range site.

34—Okeelanta muck, tidal. This is a very poorly drained organic soil in the tidal marsh, mainly along the Manatee and Braden Rivers. Slopes are less than 2 percent.

Typically, the surface layer is black and dark reddish brown muck to a depth of 39 inches. Below the muck

there is light brownish gray sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Gator and Myakka, tidal, soils. Also included are small areas of soils that are similar to Okeelanta soils except that limestone is within a depth of 60 inches.

The water table fluctuates with the tide. This soil is flooded during normal high tides. The available water capacity is very high in the organic layers and low in the underlying sand. Natural fertility is high. Permeability is rapid throughout.

The native vegetation consists dominantly of needlegrass rush, seashore saltgrass, marshhay cordgrass, big cordgrass, and smooth cordgrass.

This soil is not suitable for cultivated crops or pasture grasses or for use as woodland. The potential for these crops is very low because of the daily flood hazard and the high content of salt. Water control can be accomplished only by diking and pumping.

This soil is in capability subclass VIIIw and in the Salt Marsh range site.

35—Ona fine sand, ortstein substratum. This is a nearly level, poorly drained soil that is in areas of broad flatwoods. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is black fine sand about 5 inches thick. The subsoil in the upper part is very dark brown and dark reddish brown fine sand 11 inches thick. The next layer is brown and light brownish gray fine sand 36 inches thick. The subsoil in the lower part is black fine sand that is weakly cemented to a depth of 68 inches and black friable fine sand to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Myakka, Pompano, St. Johns, Waveland, and Wauchula soils.

In most years, a water table is at a depth of 10 to 40 inches for periods of 4 to 6 months out of the year. It rises to a depth of less than 10 inches for 1 to 2 months out of the year. It may recede to a depth of more than 40 inches in very dry seasons. Permeability is moderate in the upper part of the subsoil, slow or very slow in the lower part of the subsoil, and rapid in the other layers. The available water capacity is medium in the surface layer and in the subsoil and low in the layer between the two parts of the subsoil.

The native vegetation consists of pine trees and an understory of sawpalmetto, running oak, pineland threeawn, and gallberry.

Wetness is a severe limitation to use of this soil for cultivated crops. The soil is well suited to many kinds of vegetable crops if a water control system removes excess water in wet seasons and distributes water for subsurface irrigation in dry seasons. Other management practices include crop rotations with close growing, soil improving crops on the soil at least two-thirds of the time. These crops and crop residue help protect the soil from erosion. Fertilizer and lime should be added to the soil.

The soil is poorly suited to citrus unless drained. It is moderately suited to oranges and grapefruit if drainage removes excess water rapidly to a depth of about 4 feet. The trees sould be planted in beds. Close growing vegetation between the trees helps protect the soil from wind and water erosion. Fertilizer and occasional applications of lime are needed. Irrigation is required for highest yields. Irrigation is feasible only where water is readily available.

If well managed, this soil is well suited to pangolagrass, bahiagrass, and clover. Simple drainage to remove excess water, regular use of fertilizers and lime, and controlled grazing are required to maintain healthy plants for highest yields.

The potential productivity for pine trees is moderately high. Equipment limitations and seedling mortality are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

36—Orlando fine sand, moderately wet, 0 to 2 percent slopes. This is a moderately well drained, nearly level soil on uplands.

Typically, the surface layer is very dark gray fine sand about 12 inches thick. The underlying material is fine sand to a depth of 80 inches or more. It is dark brown to a depth of 18 inches, brown to a depth of 43 inches, pale brown to a depth of 58 inches, and grayish brown to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Tavares soils and small areas where a layer of dark colored fine sand is below a depth of about 70 inches.

In most years, the water table is at a depth of 40 to 72 inches. In some years it rises to a depth of less than 40 inches for brief periods. The available water capacity is low in the surface layer and very low in the other layers. Permeability is rapid throughout. Natural fertility is low. The content of organic matter is moderate in the surface layer and moderately low to low in the other layers.

The native vegetation consists of slash and longleaf pines, laurel, live, and turkey oaks and an understory of widely spaced sawpalmetto, pineland threeawn, and paspalum.

Sandy texture is a severe limitation to use of this soil for cultivated crops. Intensive soil management practices are required if this soil is cultivated. Droughtiness and rapid leaching of applied plant nutrients reduce the potential yields and the variety of adapted crops. Crop rotations should keep close growing crops on the soil at least two-thirds of the time. Regular applications of lime and fertilizer are needed. Irrigation of a few high value crops is generally feasible where irrigation water is readily available.

This soil is well suited to citrus, and in many areas it is used for citrus. Close growing plants between the trees help protect the soil from blowing. In most years, good yields of citrus can be obtained without irrigation. Irrigation is generally feasible where irrigation water is readily available.

This soil is well suited to pasture. Deep rooting plants such as Coastal bermudagrass and bahiagrass generally grow well if the soil is well fertilized and limed. Drought limits yields in prolonged dry seasons. Controlled grazing is needed to maintain plant vigor for best yields.

The potential productivity for pine trees is moderately high. The main management concerns are equipment limitations, seedling mortality, and plant competition. Slash pine is better suited than other species.

This soil is in capability subclass IIIs and in the Longleaf Pine-Turkey Oak Hills range site.

37—Orsino fine sand, 0 to 5 percent slopes. This is a nearly level to gently sloping, moderately well drained soil on low ridges and knolls at some of the higher elevations in the county. Slopes are convex and range from 0 to 5 percent.

Typically, the surface layer is gray fine sand about 4 inches thick. The subsurface layer is white fine sand 14 inches thick. The subsoil in the upper part, to a depth of 27 inches, is brownish yellow fine sand that has dark reddish brown bodies that are not cemented. Tongues of white fine sand from the subsurface layer extend into this layer. The subsoil in the lower part, to a depth of 50 inches, is brownish yellow and yellow fine sand. The substratum to a depth of 80 inches or more is white fine sand.

Included with this soil in mapping are small areas of Cassia and Pomello soils and small areas of soils that are similar to Orsino soils except that a water table is at a depth of more than 60 inches.

In most years, a water table is at a depth of 40 to 60 inches for more than 6 months out of the year. It recedes to a depth of more than 60 inches during periods of lower rainfall. Permeability is very rapid. Natural fertility, content of organic matter, and the available water capacity are very low.

The natural vegetation consists mainly of sand pine, sand live oak, and a few sawpalmetto. Native grasses include pineland threeawn. In some places near the Little Manatee River, the native vegetation consists almost entirely of dense stands of sand live oak. In the Whitfield Estates, in the extreme southwestern part of the county, there is some scrub hickory.

Droughtiness is a very severe limitation to use of this soil for cultivated crops. Intensive management practices are required if the soil is cultivated. Droughtiness and rapid leaching of plant nutrients reduce the variety and potential yields of adapted crops. Row crops should be planted on the contour. Crop rotations should keep close growing crops on the soil at least three-fourths of the time. A few crops produce good yields without irrigation. Irrigation of these crops is generally feasible where water is readily available.

The soil is suitable for citrus in areas that are relatively free from freezing temperatures. Close growing plants between the trees help protect the soil from blowing or from washing. In some years good yields of oranges and grapefruit can be obtained without irrigation. A well designed irrigation system to maintain optimum moisture conditions is needed for best yields.

The soil is moderately suited to pasture and hay crops. Deep rooting plants such as Coastal bermudagrass and bahiagrass are well adapted, but periodic droughts reduce yields. Regular applications of fertilizer and lime are needed. Controlled grazing helps to maintain plant vigor.

The potential productivity for pine trees is moderate. Equipment limitations and seedling mortality are the main management concerns. South Florida slash pine and sand pine are the best trees to plant.

This soil is in capability subclass IVs and in the Sand Pine Scrub range site.

38—Palmetto sand. This is a nearly level, poorly drained soil in flatwoods. The soil is in sloughs, in poorly defined drainageways, and in narrow bands around some ponds. Slopes are smooth to slightly concave and are less than 2 percent.

Typically, the surface layer is black sand about 8 inches thick. The subsurface layer is dark gray or gray sand to a depth of 25 inches. The upper part of the subsoil is dark grayish brown and very dark grayish brown sand to a depth of about 45 inches. The lower part of the subsoil is grayish brown and dark grayish brown sandy clay loam and sandy loam to a depth of about 64 inches and dark grayish brown loamy sand to a depth of 68 inches.

Included with this soil in mapping are areas of similar soils that have a yellowish subsurface layer, that do not have a loamy subsoil, or that have a slightly more developed, brownish subsurface layer. Also included are small areas of Delray soils. The included soils make up about 25 percent of the map unit.

In most years, if this Palmetto soil is not drained, the water table is within 10 inches of the surface for 2 to 6 months out of the year. In some areas the soil may be ponded briefly after heavy rainfall. Permeability is rapid in the surface and subsurface layers and moderately slow in the subsoil. The available water capacity is low to medium in the surface and subsurface layers and medium in the subsoil.

Some areas are used for improved pasture. A few areas are used for vegetable crops. In many areas the native vegetation consists of chalky bluestem, blue maidencane, sand cordgrass, pineland threeawn, low panicums, scattered slash pines, and clumps of sawpalmetto.

Wetness and a thick sandy surface layer are very severe limitations to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless very intensive management practices are followed. This soil is well suited to a number of vegetable crops if a water control system removes excess water in wet seasons and distributes water for subsurface irrigation in dry seasons. Row crops should be rotated with close growing, soil improving crops that are on the soil three-fourths of the time. Crops residue and soil improving crops should be plowed under. Seedbed preparation should include bedding of the rows. Fertilizer and lime should be added to the soil according to the needs of the crops.

This soil is suitable for citrus only if a carefully designed water control system maintains the water table below a depth of 4 feet. The trees should be planted in beds, and a vegetative cover is needed between the trees. Regular applications of fertilizers and lime are needed.

This soil is well suited to pasture. Pangolagrass, improved bahiagrass, and white clover grow well under good management. Water control measures are needed to remove excess surface water after heavy rains. Regular applications of fertilizers and lime are needed. Controlled grazing helps prevent weakening of the plants.

The potential productivity for pine trees is moderate if a water control system is installed. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant but only in areas with adequate water control.

This soil is in capability subclass IVw and in the Slough range site.

39—Parkwood Variant complex. This complex consists of nearly level, poorly drained, and very poorly drained soils on cabbage palm hammocks, in drainageways, and around the edges of ponds. The soils are so intermixed that they could not be mapped separately at the scale selected for mapping.

Parkwood Variant soils make up about 40 percent of this complex. A soil that is similar to Parkwood Variant soils makes up 15 percent; there is no limestone in this soil. A soil that is similar to Chobee and Wabasso soils makes up 30 percent; there is limestone beneath the loamy layer. Scattered areas of Anclote, Delray, Felda, and Manatee soils make up 20 percent.

Typically, the surface layer of Parkwood Variant soils is black and very dark gray loamy fine sand about 9 inches thick. The subsoil extends to a depth of 37 inches; it is gray fine sandy loam. The substratum is white soft limestone to a depth of 80 inches or more. The soil is calcareous throughout.

In most years, a water table is within 10 inches of the surface for 2 to 4 months during wet seasons. The available water capacity is low in the surface layer and medium in the subsoil. Permeability is very rapid in the surface layer and moderately rapid in the subsoil. Natural fertility is medium.

The natural vegetation consists of cabbage palm, a few live oak, slash pine, water oak, magnolia, and an undergrowth of shrubs, vines, grasses, and sawpalmetto. A few areas are used for vegetables, citrus, and improved pasture grasses.

Wetness is a severe limitation to use of these soils for cultivated crops. The soils are suitable for many fruit and vegetable crops if a complete water control system removes excess surface and internal water rapidly. The system should also distribute water for subsurface irrigation. Soil improving crops and crop residue help protect the soil from erosion. Other important management practices include crop rotations that keep the soil in a close growing crop at least two-thirds of the time, seedbed preparation, including bedding, and fertilizers applied according to the needs of the crop.

These soils are well suited to citrus if a water control system maintains good drainage to a depth of about 4 feet. Bedding and planting the trees in the beds help provide good surface drainage. Close growing vegetation maintained between the trees helps protect the soil from blowing in dry weather and from washing during rains. Regular applications of fertilizer are required. Applications of lime are not needed.

These soils are excellent for pasture. They are well suited to pangolagrass, bahiagrass, and clover. Pastures of grass only or a grass-clover mixture can be grown under good management. Regular applications of fertilizers and controlled grazing are needed for highest yields.

The potential productivity for pine trees is moderately high. Equipment limitations and seedling mortality are the main management concerns. Slash pine is the best tree to plant.

These soils are in capability subclass IIIw and in the Cabbage Palm Hammock range site.

40—Pinellas fine sand. This is a nearly level, poorly drained soil in areas of flatwoods bordering sloughs and depressions. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand about 5 inches thick. The subsurface layer is fine sand to a depth of 33 inches. In the upper 6 inches it is grayish brown, and below that, it has carbonate accumulations and is calcareous. It is dark grayish brown to a depth of 15 inches and gray to a depth of 33 inches. The subsoil is gray sandy clay loam 12 inches thick. The substratum is light gray fine sand to a depth of 53 inches and light gray fine sand and many shell fragments to a depth of 60 inches or more.

Included with this soil in mapping are small areas of similar soils that have a subsoil at a depth of more than 40 inches, areas of similar soils that have a dark colored

surface layer more than 6 inches thick, and areas of soils that have a yellowish layer above the subsoil and limestone below. Also included are small areas of Bradenton, Broward Variant, EauGallie, and Wabasso soils.

In most years, if this soil is not drained, the water table is at a depth within 10 inches of the surface for less than 3 months out of the year and at a depth of 10 to 40 inches for 4 to 6 months out of the year. It may recede to a depth of more than 40 inches during extended dry periods. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is very low in the surface layer and medium in the subsurface layer and subsoil. Natural fertility and the content of organic matter are low.

In some areas this soil is used for vegetables and improved pasture. The natural vegetation consists of South Florida slash pine, cabbage palm, sawpalmetto, waxmyrtle, gallberry, broomsedge, chalky bluestem, blue maidencane, lopsided indiangrass, sand cordgrass, and pineland threeawn.

If this soil is not drained, wetness is a severe limitation to use of this soil for cultivated crops. The soil is well suited to many vegetable crops if a complete water control system removes excess surface water and distributes water for subsurface irrigation. Cover crops and all crop residue should be plowed under. Other management practices include crop rotations that keep the soil in close growing cover crops between cropping seasons, seedbed preparation, including bedding, and fertilizers applied according to the needs of the crop.

This soil is suited to citrus if a well designed water control system maintains the water table below a depth of 4 feet. Trees planted in beds helps provide good surface drainage. Close growing vegetation maintained between the trees helps protect the soil from blowing. Regular applications of fertilizers are needed.

This soil is well suited to pangolagrass, improved bahiagrass, and clover. Regular applications of fertilizers and controlled grazing are needed.

The potential productivity for pine trees is medium. The main management concerns include seedling mortality, windthrow hazard, and plant competition. Slash pine is better suited than other species.

This soil is in capability subclass IIIw and in the Cabbage Palm Flatwoods range site.

41—Pits and Dumps. Pits and Dumps consist of areas in which large excavations were made in mining for phosphate. The refuse was left on the adjoining land. There are several areas in the western part of the county. The largest is near the fuller's earth plant east of Ellenton. Most areas have been abandoned. Pits and Dumps have little or no value for crops and pasture or for pine trees. Some revegetated areas provide good wildlife habitat.

This unit is not assigned to a capability subclass or a range site.

42—Pomello fine sand, 0 to 2 percent slopes. This is a nearly level, moderately well drained soil on low ridges in flatwoods. Individual areas are irregularly shaped. Slopes are smooth to concave.

Typically, the surface layer is gray fine sand 2 inches thick. The subsurface layer is white fine sand to a depth of 46 inches. The subsoil is fine sand. In the upper 5 inches it is black. Below that, to a depth of 80 inches or more it is dark reddish brown.

Included with this soil in mapping are similar soils that have a subsoil below a depth of 50 inches. Also included are small areas of Cassia, Duette, and Zolfo soils and Pomello soils on 2 to 5 percent slopes.

In most years, the water table is at a depth of 24 to 40 inches for 1 to 4 months out of the year and at a detph of 40 to 60 inches for 8 months out of the year. The available water capacity is very low except in the subsoil, where it is medium. Natural fertility is low. Permeability is very rapid in the surface and subsurface layers and moderately rapid in the subsoil.

The natural vegetation consists of dwarf and sand live oaks, sawpalmetto, longleaf and slash pines, pineland threeawn, running oak, creeping bluestem, broomsedge bluestem, splitbeard bluestem, lopsided indiangrass, switchgrass, panicum, and paspalum. A few areas are used for citrus, vegetables, and improved pasture grasses where the areas are near other soils used for these crops.

This soil is not suitable for most commonly cultivated crops. It is poorly suited to citrus. Only fair yields can be obtained under a high level of management. Sprinkler irrigation is needed for best yields. Regular applications of fertilizers and lime are needed.

The soil is only fairly suitable for improved pasture grasses even under good management. Bahiagrass is better adapted than other grasses. Clovers are not suited. Droughtiness is the major limitation except in the wet season. Regular applications of fertilizer and lime are needed. Controlled grazing permits vigorous growth for highest yields and provides good ground cover.

The potential productivity is moderate for pine trees. Seedling mortality, plant competition, and equipment mobility are the main management concerns. Sand pine is the best tree to plant.

This soil is in capability subclass VIs and in the Sand Pine Scrub range site.

43—St. Johns fine sand, 2 to 5 percent slopes. This is a gently sloping, poorly drained soil on seepy side slopes adjacent to drainageways. Most areas of this soil are long and narrow.

Typically, the surface layer is black fine sand to a depth of 7 inches and very dark gray fine sand to a depth of 13 inches. The subsurface layer, to a depth of

28 inches, is light gray fine sand. The subsoil is black to very dark gray fine sand about 32 inches thick. The sand grains in the subsoil are well coated with organic matter. The next layer is dark gray fine sand about 8 inches thick, and the layer below that, to a depth of 80 inches or more, is black fine sand.

Included with this soil in mapping are small but numerous areas of very poorly drained sandy soils in seeps. Also included are areas of a similar soil that has a subsoil below a depth of 30 inches, areas of other similar soils that are cemented in the subsoil, and a few areas where slopes are greater than 5 percent.

In most years, if this soil is not drained, the water table is within a depth of 15 inches for 2 to 6 months out of the year and at a depth of 15 to 30 inches during periods of lower rainfall. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility is low, and the content of organic matter is moderate. The available water capacity is medium in the subsoil and low in the surface and subsurface layers.

The natural vegetation consists of slash pine, loblolly bay, sawpalmetto, and gallberry. The native grasses include chalky bluestem, cinnamon fern, and pineland threeawn.

If this soil is not drained, wetness and the erosion hazard are severe limitations to use of this soil for cultivated crops. Only water tolerant crops can be grown. Water control measures are needed to remove surface water during periods of high rainfall. Good management practices also include contour cultivation and bedding of row crops, alternating strips of row crops with cover crops, and crop rotations that maintain cover crops on the soil at least two-thirds of the time. These crops and all other crop residue should be plowed under. Fertilizer and lime should be added to the soil according to the needs of the crop.

Unless it is drained, this soil is poorly suited to citrus. It is moderately suited to oranges and grapefruit if excess water is removed rapidly to a depth of about 4 feet. The trees should be planted in contour beds. Close growing vegetation between the trees helps protect the soil from wind and water erosion. Regular applications of fertilizer and occasional applications of lime are needed. Highest yields require irrigation, which is feasible only where water is readily available.

If well managed, this soil is well suited to pangolagrass, bahiagrass, and clover. Simple drainage to remove excess water, regular use of fertilizers and lime, and controlled grazing are needed to maintain healthy plants for highest yields.

Potential productivity for pine trees is moderate. Slash pine is the best tree to plant. The main management problems are equipment limitations during periods of heavy rainfall, seedling mortality, and plant competition.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

44—St. Johns-Myakka complex. This complex consists of nearly level soils in broad areas of flatwoods. The soils are mainly in the northeastern part of the county; they are also in smaller areas scattered throughout the eastern half of the county. The areas of these soils are so intermixed that they could not be mapped separately at the scale selected for mapping. Slopes are less than 2 percent.

St. Johns soils make up about 45 percent of the complex; Myakka soils make up 40 percent; and Immokalee, Ona, Palmetto, and Wauchula soils make up 15 percent.

Typically, the surface layer of St. Johns soils is black fine sand about 11 inches thick. The subsurface layer is light gray fine sand 15 inches thick. The subsoil is black and dark reddish brown fine sand. It extends to a depth of 43 inches. Below that, to a depth of 80 inches or more, there is brown, pale brown, and light brownish gray fine sand.

In most years, the water table in St. Johns soils is within a depth of 15 inches for 2 to 6 months out of the year and between a depth of 15 and 30 inches for more than 6 months out of the year. Permeability is moderate in the subsoil and rapid in the other layers. The available water capacity is medium in the subsoil and low in the other layers.

Typically, the surface layer of Myakka soils is very dark gray fine sand about 5 inches thick. The subsurface layer is gray and light gray fine sand about 19 inches thick. The subsoil, to a depth of about 46 inches, is black, dark reddish brown, and dark brown fine sand. Below that, to a depth of 80 inches or more, there is brown, pale brown, and light brownish gray fine sand.

In most years, the water table in Myakka soils is at a depth of 10 inches or less for 1 to 4 months out of the year. It recedes to a depth of 40 inches or more in dry seasons. The available water capacity is medium in the subsoil and very low in the other layers. Permeability is rapid in the surface layer, subsurface layer, and substratum and moderate or moderately rapid in the subsoil.

The natural vegetation in areas of this complex is longleaf and slash pines and an undergrowth of sawpalmetto, running oak, gallberry, waxmyrtle, huckleberry, pineland threeawn, and scattered fetter bushes.

Wetness and the sandy texture are very severe limitations to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless intensive management practices are used. The soils are suitable for a number of vegetable crops if a water control system is installed to remove excess water in wet seasons and distribute water for subsurface irrigation in dry seasons. Seedbed preparation should include bedding of the rows.

The soils are suitable for citrus only if a carefully designed water control system is installed to maintain

the water table below a depth of 4 feet. Planting the trees in beds helps lower the water table. A vegetative cover is needed between the trees to reduce erosion.

If well managed, the soils are well suited to pangolagrass, improved bahiagrass, and white clover. Water control measures help remove excess surface water after heavy rains. Regular applications of fertilizer and lime are needed. Controlled grazing helps prevent weakening of the plants.

The potential productivity for pine trees is moderate. Slash pine is the best tree to plant. The main management problems are equipment limitations during periods of heavy rainfall, seedling mortality, and plant competition. A water control system helps remove excess surface water.

The soils are in capability subclass IVw and in the South Florida Flatwoods range site.

45—Tavares fine sand, 0 to 5 percent slopes. This is a moderately well drained soil on ridges and knolls. Slopes are smooth to convex.

The soil is fine sand to a depth of 80 inches or more. Typically, the surface layer is very dark gray to a depth of about 6 inches. The underlying material is yellowish brown and light yellowish brown to a depth of 56 inches, very pale brown to a depth of 79 inches, and white to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Adamsville Variant, Orlando, Orsino, and Zolfo soils. Also included are small areas of Tavares soils on 5 to 8 percent slopes.

In most years, if this soil is not drained, a water table is at a depth of 40 to 60 inches for 6 to 12 months and at a depth of 60 inches or more during very dry periods. The available water capacity is very low. Permeability is very rapid. Natural fertility is low.

The natural vegetation consists of slash and longleaf pine, blackjack, turkey, and post oak, and an understory of pineland threeawn, creeping bluestem, lopsided indiangrass, hairy panicum, low panicums, purple lovegrass, and broomsedge bluestem.

Droughtiness and rapid leaching of plant nutrients are severe limitations to use of this soil for most cultivated crops. Only certain kinds of crops can be grown, and potential yields are limited. Management practices include row crops on the contour and alternate strips of close growing crops. Crop rotation should include close growing crops on the soil at least two-thirds of the time. The soil should be fertilized and limed for all crops. Irrigation of high-value crops is generally feasible where irrigation water is readily available.

This soil is highly suitable for citrus where it is relatively free from freezing temperatures. In many areas it is used for citrus. Close growing vegetation is needed between the trees to help prevent erosion. Citrus generally can be grown without irrigation. Irrigation to maintain optimum yields generally is feasible where irrigation water is readily available. Fertilizer and lime are needed.

This soil is well suited to pangolagrass, Coastal bermudagrass, and bahiagrass. Yields are good if the soil is fertilized and limed. Controlled grazing is needed to maintain vigorous plants for maximum yields.

The potential productivity for pine trees is moderately high. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIs and in the Longleaf Pine-Turkey Oak Hills range site.

46—Tavares fine sand, cemented substratum, 2 to 5 percent slopes. This is a moderately well drained soil on low benches along some of the larger creeks and rivers. Slopes are generally smooth and grade to streams and rivers.

This soil is fine sand to a depth of about 60 inches. Typically, the surface layer, to a depth of about 7 inches, is very dark gray. The underlying material, to a depth of 60 inches, is yellowish brown and light brown and has segregated iron mottles in shades of yellow, red, and brown in the lower part. Below that, to a depth of 80 inches or more it is mottled yellow, brown, and gray extremely hard iron-cemented sand.

Included with this soil in mapping are small areas of Braden soils. Also included are small areas of the Tavares soil on 0 to 2 percent slopes.

In most years, if this soil is not drained, the water table is at a depth of 40 to 60 inches for 6 to 12 months and at a depth of more than 60 inches during very dry periods. The available water capacity is very low. Permeability is very rapid above the cemented layer and slow in that layer. Natural fertility is low.

The natural vegetation is a hammock consisting chiefly of water and laurel oaks and a few other hardwoods and a heavy undergrowth of vines and shrubs.

Droughtiness and rapid leaching of plant nutrients are severe limitations to use of this soil for most cultivated crops. They limit the kinds of crops that can be grown and reduce potential yields. Management practices should include row crops planted on the contour and alternate strips of close growing crops. Crop rotations should include close growing crops on the soil at least two-thirds of the time. All crops should be fertilized and limed. Irrigation of high-value crops is usually feasible where irrigation water is readily available.

This soil is highly suitable for citrus where it is relatively free from freezing temperatures. Close growing vegetation is needed between the trees to reduce erosion. Citrus generally can be grown without irrigation. Irrigation to maintain optimum yields is generally feasible where irrigation water is readily available. Fertilizer and lime are needed.

The soil is well suited to pangolagrass, Coastal bermudagrass, and bahiagrass. Yields are good if the

soil is fertilized and limed. Controlled grazing helps maintain vigorous plants for maximum yields.

The potential productivity for pine trees is moderately high. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIs and in the Longleaf Pine-Turkey Oak Hills range site.

47—Tomoka muck. This is a nearly level, very poorly drained organic soil in freshwater marshes. Slopes are less than 2 percent.

Typically, in the uppermost 28 inches the soil is black and dark reddish brown muck. Below that, there is gray and light brownish gray sand 4 inches thick and black loamy sand and sand 3 inches thick. Below that, to a depth of 75 inches or more, there is gray sandy clay loam.

Included with this soil in mapping are small areas of Chobee, Delray, Floridana, and Manatee soils and areas where the organic material is less than 16 inches thick.

Permeability in the muck and upper sandy layers is rapid and in the loamy layers is moderately rapid or moderate. In most years a water table is at a depth within 10 inches of the surface for 9 to 12 months, and water is commonly above the surface. In dry periods it is at a depth of 10 to 30 inches.

In most areas the natural vegetation consists of maidencane, sawgrass, cattails, flags, and scattered to dense thickets of woody button bush. A few areas are in swamp hardwoods consisting of maple, gum, bay, and other wetland hardwoods. Some areas are used as range and improved pasture.

This soil is suited to vegetables if a water control system keeps the water table at the proper depth for vegetables and improved pasture grasses and clover. The system also should reduce the hazard of subsidence by oxidation of the organic matter. The soil is not suited to citrus or to use as woodland. With water control, it is well suited to improved pasture grasses and clover, lawn grasses, and many kinds of ornamental plants.

This soil is in capability subclass IIIw and in the Freshwater Marsh and Ponds range site.

48—Wabasso fine sand. This is a nearly level, poorly drained soil in areas of broad flatwoods. Slopes are less than 2 percent.

Typically, the surface layer is very dark gray fine sand about 7 inches thick. The subsurface layer is gray fine sand 14 inches thick. The subsoil is fine sand coated with organic material to a depth of about 28 inches. In the upper 4 inches it is black, and in the lower 3 inches it is dark reddish brown. The next layer, to a depth of 37 inches, is brown fine sand. Below that, to a depth of 65 inches, there is grayish brown to gray loamy material. The substratum to a depth of 80 inches or more is sand and many shell fragments.

Included with this soil in mapping are small areas of EauGallie and Felda soils. The included soils make up about 5 percent of this unit.

In most years, if this soil is not drained, the water table is at a depth of 10 to 40 inches for more than 6 months out of the year. It is at a depth of less than 10 inches for less than 60 days in wet seasons and at a depth of more than 40 inches in very dry seasons. The available water capacity is very low or low in the sandy layers and medium in the loamy subsoil. Permeability is rapid in the sandy surface and subsurface layers, slow to very slow in the loamy layers, and very rapid in the substratum. The natural fertility is low.

The native vegetation consists of longleaf and slash pines, scattered cabbage palms, and an understory of sawpalmetto, inkberry, waxmyrtle, creeping bluestem, indiangrass, little bluestem, Florida paspalum, pineland threeawn, panicums, deertongue, grassleaf goldaster, huckleberry, and running oak. Most areas are in native vegetation and are grazed. Areas with adequate water control are used for citrus, truck crops, and improved pasture.

Wetness is a severe limitation to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless intensive water control measures are used. This soil is well suited to many kinds of flower and vegetable crops if a water control system removes excess water in wet seasons. The system should also distribute water for subsurface irrigation in dry seasons. Good management practices include crop rotations with close growing, soil improving crops on the soil at least two-thirds of the time. These crops and the residue of all other crops should be plowed under. Fertilizer and lime should be added according to the needs of the crop.

This soil is poorly suited to citrus because of wetness. It is moderately suited to oranges and grapefruit if drainage removes excess water rapidly to a depth of about 4 feet after heavy rains. The trees should be planted in beds. Close growing vegetation maintained between the trees helps protect the soil from blowing when it is dry and from washing during heavy rains. Regular applications of fertilizer and occasional applications of lime are needed. For highest yields, irrigation through the water control system or by sprinklers is required in seasons of low rainfall.

If well managed, this soil is well suited to pangolagrass, bahiagrass, and clover. Simple drainage to remove excess surface water is required during periods of high rainfall. Regular use of fertilizers and lime is also needed. Carefully controlled grazing helps maintain healthy plants for highest yields.

The potential productivity for pine trees is medium. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

49—Wabasso fine sand, rarely flooded. This is a nearly level, poorly drained soil on stream terraces well above normal overflow. Slopes are 0 to 2 percent and generally grade toward the stream.

Typically, the surface layer is very dark gray fine sand 7 inches thick. The subsurface layer is gray and light gray fine sand 14 inches thick. The subsoil in the upper part is black, dark reddish brown, and brown fine sand 10 inches thick. In the lower part it is grayish brown sandy loam and gray sandy clay loam 28 inches thick. A 6-inch layer of pale brown fine sand separates the two parts. The substratum is at a depth of 65 inches. It is gray fine sand.

Included with this soil in mapping are small areas where the lower part of the subsoil is at a depth of more than 40 inches. Also included are a few small areas of Braden and Myakka soils.

In most years, if this soil is not drained, the water table is at a depth of 10 to 40 inches for more than 6 months out of the year and within a depth of 10 inches for less than 60 days in wet seasons. The soil is rarely flooded during periods of very high rainfall. Permeability is rapid in the surface and subsurface layers, in the layer between the two parts of the subsoil, and in the substratum. It is moderate or moderately rapid in the upper part of the subsoil and slow to very slow in the lower part. The available water capacity is very low in the surface and subsurface layers and in the layer between the two parts of the subsoil and medium in both parts of the subsoil.

The natural vegetation consists of an open forest of slash pine and a ground cover of sawpalmetto, creeping bluestem, panicum, and pineland threeawn. Some areas are used as improved pasture. Most areas are used as range.

Wetness is a severe limitation to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless intensive water control measures are used. It is well suited to many kinds of vegetable crops if a water control system removes excess water in wet seasons and distributes subsurface irrigation in dry seasons. Good management practices include crop rotations with close growing, soil improving crops on the soil at least two-thirds of the time. Fertilizer and lime should be added according to the needs of the crop.

The soil is poorly suited to citrus because of wetness. It is moderately suited to oranges and grapefruit if drainage removes excess water rapidly to a depth of about 4 feet after heavy rains. The trees should be planted in beds. Close growing vegetation maintained between the trees helps protect the soil from blowing when it is dry and from washing during heavy rains. Regular applications of fertilizer and occasional applications of lime are needed. For highest yields, irrigation through a water control system or by sprinklers is needed in seasons of low rainfall.

If well managed, this soil is well suited to pangolagrass, bahiagrass, and clover. Simple drainage is needed to remove excess surface water in periods of high rainfall. Regular use of fertilizers and lime is also required. Carefully controlled grazing helps maintain healthy plants for highest yields.

The potential productivity for pine trees is medium. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the best tree to plant.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

50—Wabasso Variant fine sand. This is a nearly level, poorly drained soil in areas of flatwoods in the western part of the county. Slopes range from 0 to 2 percent.

Typically, the surface layer is black fine sand about 4 inches thick. The subsurface layer is gray and light gray fine sand 19 inches thick. The subsoil is fine sand 13 inches thick. In the uppermost 7 inches it is dark reddish brown fine sand, and below that, it is mottled yellowish brown, brownish yellow, and gray sandy clay loam. A ledge of hard limestone is at a depth of 36 to 56 inches. Below the limestone there is light gray and white fine sand.

Included with this soil in mapping are similar soils except that limestone is below a depth of 40 inches. Also included are small areas of Broward Variant and Myakka soils.

In most years, if this soil has not been drained, the water table is at a depth of 10 to 40 inches for more than 5 months out of the year. It is at a depth of less than 10 inches for 1 to 4 months in wet seasons and is at a depth of more than 40 inches in very dry seasons. The available water capacity is very low or low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and slow to moderately slow in the subsoil. Natural fertility is low.

The native vegetation consists of longleaf and slash pines, cabbage palm, and an undergrowth dominantly of sawpalmetto, pineland threeawn, inkberry, lopsided indiangrass, chalky and creeping bluestem, hairy panicum, and fetterbush lyonia.

Wetness and shallow depth to rock are severe limitations to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless very intensive management practices are followed. It is suited to a number of vegetable crops if a water control system removes excess water in wet seasons. The system also should provide water for subsurface irrigation in dry seasons. Seedbed preparation should include bedding of the rows.

This soil is poorly suited to citrus without very intensive management. In areas that are relatively free from freezing temperatures, it is suitable for citrus if a carefully designed water control system maintains the water table below a depth of 4 feet. The trees should be planted in beds, and a vegetative cover is necessary between the trees. Regular applications of fertilizers and lime are needed.

If well managed, this soil is suited to pangolagrass, improved bahiagrass, and white clover. Water control measures are needed to remove excess surface water after heavy rains. Regular applications of fertilizer and lime are needed. Controlled grazing helps prevent weakening of the plants.

The potential productivity for pine trees is moderately high. Slash pine is the best tree to plant. The main management concerns are equipment use during periods of heavy rainfall, seedling mortality, and plant competition.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

51—Wauchula fine sand. This is a poorly drained, nearly level soil in broad areas of flatwoods. Slopes are less than 2 percent.

Typically, the surface layer is about 7 inches thick. In the uppermost 3 inches it is black loamy fine sand, and below that, it is very dark gray fine sand. The subsurface layer is fine sand about 13 inches thick. In the uppermost 6 inches it is gray, and below that, it is light gray. It has streaks of dark gray and very dark gray. The subsoil begins at a depth of 20 inches. In the upper part, to a depth of 25 inches, it is dark reddish brown fine sand that has sand grains coated with organic matter; and below that, it is dark brown fine sand that has black, weakly cemented bodies. The next layer is grayish brown fine sand 5 inches thick. Below that, there is light gray mottled sandy clay loam. The substratum to a depth of 80 inches or more is light gray loamy fine sand.

Included with this soil in mapping are small areas of Immokalee, Myakka, and Ona soils.

The natural vegetation consists of forest of longleaf pine, slash pine, and sawpalmetto and an understory of gallberry and pineland threeawn. Many areas have been cut over and replanted to slash pine. A few areas are used as improved pasture.

In most years, the water table is within 10 inches of the surface for 1 to 4 months out of the year and within a depth of 40 inches for about 6 months out of the year. In the driest seasons, it recedes to a depth of more than 40 inches. The available water capacity is low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The natural fertility and the content of organic matter are low.

Wetness is a severe limitation to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless intensive water control measures are used. The soil is well suited to many kinds of flower and vegetable crops if a water control system removes excess water in wet seasons and distributes subsurface irrigation in dry seasons. Good management practices include crop rotations with close growing, soil improving crops on the soil at least two-thirds of the time. Fertilizer and lime should be added according to the needs of the crop.

This soil is poorly suited to citrus because of wetness. It is moderately suited to oranges and grapefruit if a water control system removes excess water rapidly to a depth of about 4 feet after heavy rains. The trees should be planted in beds. Close growing vegetation maintained between the trees helps protect the soil from blowing when it is dry and from washing during heavy rains. Regular applications of fertilizer and occasional applications of lime are needed. For highest yields, irrigation through the water control system or by sprinklers is needed in seasons of low rainfall.

If well managed, this soil is well suited to pangolagrass, bahiagrass, and clover. Simple drainage is needed to remove excess surface water in periods of high rainfall. Carefully controlled grazing helps maintain healthy plants for highest yields.

The potential productivity for slash pine is moderately high. Bedding the rows helps seedlings to survive by providing additional aeration for the roots. For highest yields, a surface drainage system is needed to remove excess water in wet seasons.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

52—Waveland fine sand. This is a poorly drained, nearly level soil in broad areas of flatwoods. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is fine sand about 8 inches thick. In the upper 5 inches it is black, and below that, it is dark gray. The subsurface layer is 24 inches thick. In the uppermost 13 inches it is grayish brown sand, and below that, it is light gray fine sand. The subsoil, to a depth of 51 inches, is black sand. The substratum to a depth of 80 inches or more is sand that has pockets of sandy loam. In the upper 6 inches it is dark grayish brown, in the next 9 inches it is grayish brown, and in the lower part it is olive.

Included with this soil in mapping are small areas of Myakka, Ona, and Pomona soils.

In most years, the water table is within a depth of 10 inches for 1 to 4 months out of the year and within a depth of 40 inches for 6 months or more out of the year. It is above the subsoil early in the summer rainy season and after periods of heavy rainfall in other seasons. The water table recedes to a depth of more than 40 inches in extended dry seasons. The available water capacity is low in the surface layer, very low in the subsurface layer, medium in the subsoil, and low in the substratum. Permeability is rapid in the surface and subsurface

layers, very slow to slow in the subsoil, and moderate to rapid in the substratum. Natural fertility and organic matter content are low.

Large areas are cleared and used for improved pasture. The native vegetation consists of South Florida slash pine and an understory of sawpalmetto, waxmyrtle, gallberry, huckleberry, fetterbush, lopsided indiangrass, creeping bluestem, chalky bluestem, Florida threeawn, and pineland threeawn.

Wetness is a very severe limitation to use of this soil for cultivated crops. The soil is suitable for vegetable crops if a water control system removes excess water. Good management practices include crop rotations that keep the soil in close growing, soil improving crops at least two-thirds of the time. Fertilizer and lime should be applied according to the needs of the crop.

This soil is moderately suited to citrus if a drainage system rapidly removes excess water after heavy rains to a depth of about 4 feet. Planting the trees in beds helps to lower the water table. Close growing vegetation between the trees helps protect the soil from erosion. Regular applications of fertilizer are required. Irrigation is needed in seasons of low rainfall for highest yields.

If well managed, this soil is well suited to pangolagrass, bahiagrass, and clovers. Water control measures are needed to remove surface water in periods of heavy rainfall. Regular applications of fertilizer are required. Carefully controlled grazing helps to maintain healthy plants for highest yields.

The potential productivity for pine is moderate. Slash pine is the best adapted species. For highest yields, a good drainage system is needed to remove excess surface water. Equipment limitations and seedling mortality are the main management concerns.

This soil is in capability subclass IVw and in the South Florida Flatwoods range site.

53—Wulfert-Kesson association. This map unit consists of nearly level, very poorly drained Wulfert and Kesson soils. It is about 45 percent Wulfert soils, 35 percent Kesson soils, and 20 percent other soils. These soils occur in a regular and repeating pattern in mangrove swamps along the Gulf Coast and on coastal islands. Generally, Kesson soils are in the outer parts of areas of this complex near the water's edge, and Wulfert soils are in the inner parts. Areas of the individual soils are large enough to map separately, but in considering the present and predicted use they are mapped as one unit. Slopes are less than 1 percent.

The composition of this map unit is more variable than that of most other map units in the county; nevertheless, valid interpretations for the expected uses of the soils can still be made.

Typically, the surface layer of Wulfert soils is dark reddish brown and dark brown muck that extends to a depth of about 36 inches. Below that, there is gray fine sand to a depth of 60 inches or more.

Wulfert soils are flooded daily by high tides. Permeability is rapid throughout. The available water capacity is medium to high in the muck layers and very low to low in the sandy layers.

Typically, the surface layer of Kesson soils is black fine sand 6 inches thick. Below the surface layer there is pale brown, light gray, and white fine sand to a depth of 80 inches or more. Shell fragments are few to common in these layers.

Kesson soils are flooded daily by high tides. Permeability is moderately rapid to rapid throughout. The available water capacity is medium in the surface layer and low to medium in the other layers.

Included with the soils in this map unit are areas of beaches on the north and west side of some of the larger islands. Also included are areas of Wulfert soils that overlie limestone in some places. Also included are small areas of silty soils that overlie limestone.

The natural vegetation consists mostly of mangrove, but in some places it also consists of seashore saltgrass, batis, and oxeye daisy. Some places are bare.

This unit is not suitable for cultivation, citrus, or pasture or for use as woodland.

This unit is in capability subclass VIIIw. It is not assigned to a range site.

54—Zolfo fine sand, 0 to 2 percent slopes. This is a somewhat poorly drained soil on low to high ridges and knolls in flatwoods.

Typically, the surface layer is very dark gray fine sand about 7 inches thick. The subsurface layer is light brownish gray, pale brown, and light gray fine sand. The subsoil begins at a depth of 65 inches. In the upper 7 inches it is dark grayish brown fine sand, and below that, it is dark brown fine sand to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Cassia, Duette, Orsino, Pomello, and Tavares soils. Also included are soils that are very similar to Zolfo soils except that the subsoil is less well developed.

Permeability is very rapid in the surface and subsurface layers and moderate in the subsoil. In most years, if this soil is not drained, the high water table is at a depth of 24 to 40 inches for 2 to 6 months out of the year. In some years the water table is at a depth of 10 to 24 inches for periods of as much as 2 weeks. The water table is at a depth of less than 60 inches for more than 9 months out of the year.

The available water capacity is low to very low in the surface and subsurface layers and medium in the subsoil. Natural fertility is low, and the content of organic matter is low to very low.

The native vegetation consists of slash and longleaf pines, laurel, bluejack, turkey, live and water oaks, and an understory of sawpalmetto, pineland threeawn, broomsedge and chalky bluestems, and other perennial grasses.

Periodic wetness that limits the root zone is a severe limitation to use of this soil for cultivated crops. Only a few adapted crops can be grown unless intensive water control measures are used. This soil is well suited to many kinds of flowers and vegetables if a water control system removes excess water in wet seasons. The system also should distribute water during dry periods. Planting the crops in beds helps lower the water table. Good management practices include the use of soil improving crops and crop rotations that keep a close growing crop on the soil at least two-thirds of the time. Crop residue should be plowed under. Fertilizer and lime should be added according to the needs of the crop.

This soil is moderately suited to citrus except in areas that are subject to frequent freezing temperatures. A water control system is needed to remove excess water rapidly and maintain the water table to a depth of about 4 feet. Planting the trees in beds helps lower the water table.

Close growing vegetation maintained between the trees helps protect the soil from blowing in dry weather and from washing during heavy rains. Regular applications of fertilizer and lime are required. For highest yields, irrigation is needed in seasons of low rainfall.

This soil is moderately well suited to pangolagrass and bahiagrass. A simple system to remove excess surface water in periods of high rainfall is needed. Regular use of fertilizers and lime is needed. Controlled grazing helps maintain healthy plants for highest yields.

The potential productivity for pine trees is moderately high. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Slash pine is the most suitable species to plant.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

55—Zolfo fine sand, 2 to 5 percent slopes. This is a somewhat poorly drained soil on slopes of ridges that border the larger streams and rivers.

Typically, the surface layer is a gray fine sand about 4 inches thick. The subsurface layer is light brownish gray, pale brown, light gray, and white fine sand. The subsoil begins at a depth of about 65 inches. In the upper 15 inches it is dark reddish brown fine sand, and below that, it is black fine sand to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Cassia, Duette, Orsino, Pomello, and Tavares soils. Also included are soils that are very similar to Zolfo soils except that the subsoil is less well developed and areas of Zolfo soils on 5 to 8 percent slopes.

Permeability is very rapid in the surface and subsurface layers and moderate in the subsoil. In most years, if this soil is not drained, a high water table is at a depth of 24 to 40 inches for 2 to 6 months out of the year. In some years the water table is at a depth of 10 to 24 inches for periods of as much as 2 weeks. The water table is at a depth of less than 60 inches for more than 9 months out of the year.

The available water capacity is low to very low in the surface and subsurface layers and medium in the subsoil. Natural fertility is low, and the content of organic matter is low to very low.

The native vegetation consists of slash and longleaf pines, laurel, bluejack, turkey, live, and water oaks, and an understory of sawpalmetto, pineland threeawn, broomsedge and chalky bluestems, and other perennial grasses.

Periodic wetness that limits the root zone and a slight hazard of erosion are severe limitations to use of this soil for cultivated crops. Only certain kinds of crops can be grown unless intensive water control measures are used. This soil is well suited to many kinds of flowers and vegetables if a water control system removes excess water in wet seasons. The system should also distribute water during dry periods. Planting the crops in beds helps lower the water table. Management practices also include crop rotations with a close growing crop on the soil at least two-thirds of the time and the use of soil improving crops. Crop residue should be plowed under. Fertilizer and lime should be added according to the needs of the crop.

This soil is moderately suited to citrus except in areas that are subject to frequent freezing temperatures. A water control system is needed to remove excess water rapidly during wet periods and lower the water table to a depth of about 4 feet. Planting the trees in beds helps lower the water table. Close growing vegetation maintained between the trees helps protect the soil from blowing in dry weather and from washing during heavy rains. Regular applications of fertilizer and lime are required. For highest yields, irrigation is needed in seasons of low rainfall.

This soil is moderately well suited to pangolagrass and bahiagrass. A simple system is needed to remove excess surface water in periods of high rainfall. Regular use of fertilizers and lime is needed. Controlled grazing helps maintain healthy plants for highest yields.

The potential productivity for pine trees is moderately high. The main management concerns are equipment limitations, seedling mortality, and plant competition. Slash pine is the most suitable species for planting.

This soil is in capability subclass IIIw and in the South Florida Flatwoods range site.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

John D. Lawrence, conservation agronomist, and Irving H. Stewart, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1974, approximately 118,000 acres in Manatee County was used for crops and pasture, according to the Census of Agriculture, the Soil Conservation Service Now-on-the-Land Records, the Manatee County Extension Service estimates, and the Florida Agricultural Statistics, Florida Crop and Livestock Reporting Service. Of this total, 70,000 acres was used for pasture; 15,000 acres for citrus; and 30,000 acres for special crops, mainly tomatoes, watermelons, sweet corn, peppers, and cucumbers. There were smaller acreages of squash, eggplant, field peas, sod, and nursery plants.

About 267,000 acres is now used as grazable woodland and native pasture. Much of this land could be used for increased crop production. The potential of the soils in Manatee County for increased food production is good. Deficiencies in soil quality are somewhat offset by the climate and the availability of water.

Acreage in crops, pasture, and woodland has gradually decreased as urban development takes up more and more land. In 1967, about 20,000 acres in the county was urban land. Since then, the acreage of urban land has been increasing about 10 percent per year, according to estimates of the Tampa Bay Regional Planning Council. The use of this soil survey to help make broad land use decisions that will influence the future role of farming in the county is discussed in the section "General soil map units".

Soil erosion is a problem on about one-tenth of the cropland in Manatee County. On the poorly drained Myakka and St. Johns soils, where the slope is more than 2 percent, erosion is a hazard.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity drops as the content of organic matter in the soil is reduced and part of the subsurface layer or the subsoil is incorporated into the plow layer. Second, soil erosion on farmland results in sedimentation of streams. Control of erosion minimizes the pollution of streams by sediment and improves the

quality of water for municipal and recreation use and for fish and wildlife.

Erosion-control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps a plant cover on the soil for extended periods can hold soil losses through erosion to an amount that will not reduce the productive capacity of the soil. On livestock farms, where pasture and hay are necessary, the legume and grass crops in the cropping system reduce erosion on sloping land and also provide nitrogen and improve tilth for the following crop. Minimizing tillage and leaving crop residue on the surface help to increase infiltration of water and reduce runoff and erosion. These practices can be adapted to most soils in the county.

The soils in the county are so sandy that terracing generally is not practiced. Stripcropping and diversions reduce the length of the slope and help control runoff and erosion. They are more practical on deep, well drained soils that have smooth, uniform slopes. Diversions and sod waterways can be adapted to much of the cropland to reduce runoff and erosion.

Wind erosion is a major hazard on nearly all of the cropland in the county. Wind erosion can damage soils and tender crops in open, unprotected areas in a few hours if the winds are strong and the soil is dry and bare of vegetation and surface mulch. Maintaining vegetative cover and surface mulch minimizes wind erosion.

Wind erosion is damaging for several reasons. It reduces soil fertility by removing the finer textured soil particles and the organic matter. It damages or destroys crops by sandblasting. It spreads disease, insects, and weed seeds; and it creates health hazards and cleaning problems. Control of wind erosion helps prevent duststorms and improves air quality.

Field windbreaks of adapted trees and shrubs, such as Carolina laurelcherry, slash pine, southern redcedar, and Japanese privet, and buffer strips of small grains are effective in reducing wind erosion and crop damage. Field windbreaks and buffer strips are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The intervals depend on the erodibility of the soil and the susceptibility of the crop to damage from sandblasting.

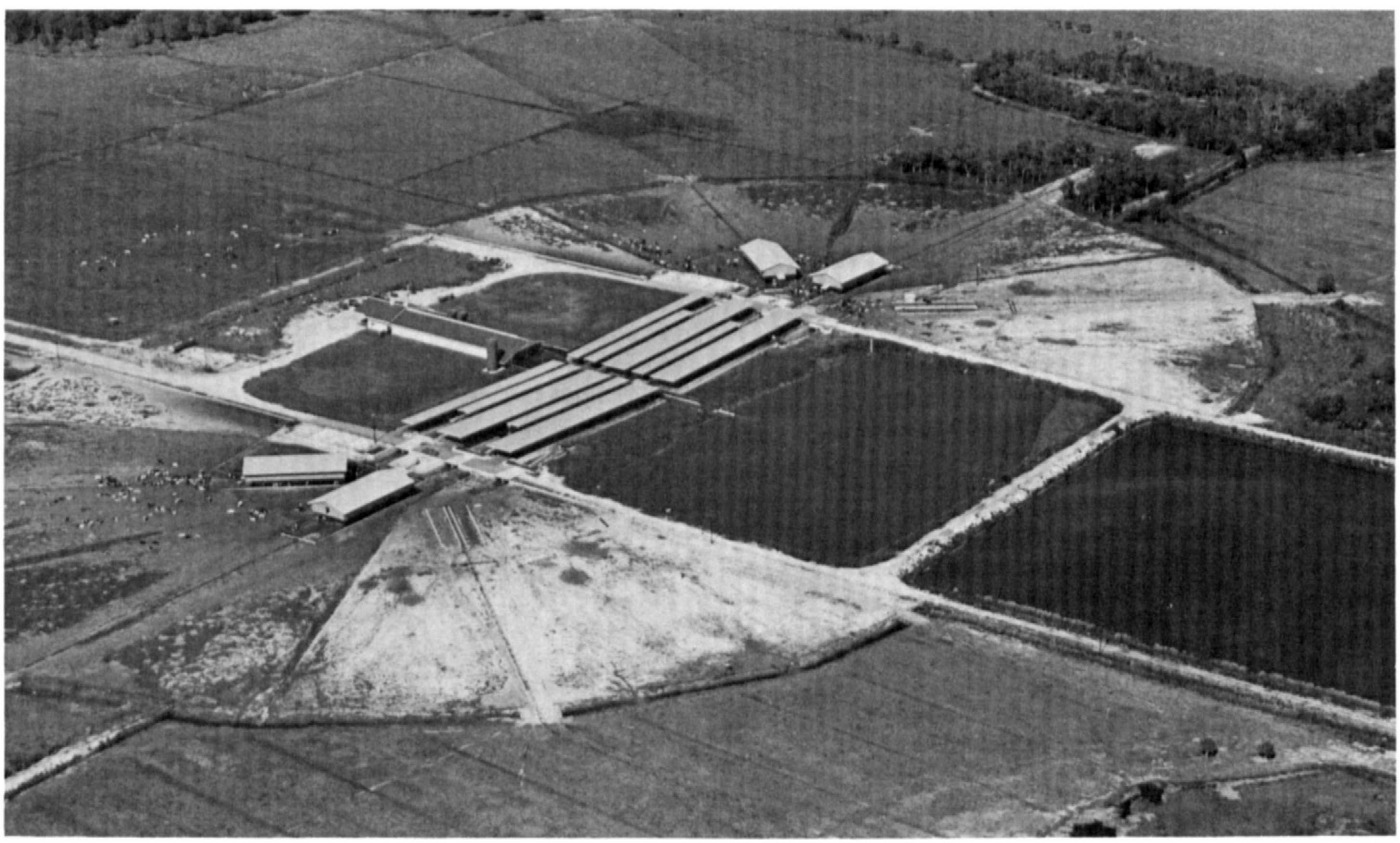

Figure 7.—A dairy farm with water control measures in the pastures and a waste management system. The soil is Myakka fine sand, 0 to 2 percent slopes.

Information for the design of erosion control practices for each kind of soil is in the "Water and Wind Erosion Control Handbook—Florida," which is available in local offices of the Soil Conservation Service.

Soil drainage is a major management need on about 90 percent of the acreage used for crops and pasture in the county (fig. 7). Some soils are naturally so wet that most crops cannot be grown without extensive water control. These are the poorly drained soils, such as Bradenton, EauGallie, Felda, Myakka, Palmetto, Pinellas, St. Johns, and Wabasso soils, and the very poorly drained soils, such as Chobee, Delray, Floridana, Manatee, Gator, Okeelanta, and Tomoka soils. In all, these soils make up about 230,000 acres.

Unless they are artificially drained, some of the somewhat poorly drained soils are wet enough in the root zone during wet seasons to cause damage to most crops in most years. Adamsville Variant and Zolfo soils, which make up about 3,500 acres, are in this category.

Unless they are artificially drained, some of the poorly drained soils are wet enough to cause some damage to pasture plants in wet seasons. These are mainly the EauGallie, Felda, Myakka, Ona, Palmetto, St. Johns, Wabasso, and Wauchula soils. The soils also have a low water-holding capacity and are droughty in dry periods. Subsurface irrigation of the soils is necessary for maximum pasture production.

The very poorly drained soils are very wet during the rainy periods. Water stands on the surface in most areas, and the production of good quality pasture is not possible without artificial drainage. Some of the very poorly drained soils are the Chobee, Delray, Floridana, Gator, Manatee, Okeelanta, and Tomoka soils.

The design of surface drainage and subsurface irrigation systems varies with the kind of soil and the grasses grown. A combination of surface drainage and subsurface irrigation systems is needed on many soils for intensive pasture production. Information on drainage and irrigation for each kind of soil is contained in the Technical Guide, which is available in the local offices of the Soil Conservation Service.

Soil fertility is naturally low in most soils in the county. Except the Chobee, Delray, Floridana, Gator, Manatee, Okeelanta, St. Johns, and Tomoka soils, the soils in the survey area have a sandy or loamy sand surface layer that is light in color and low to moderate in content of organic matter. Gator, Okeelanta, and Tomoka soils have an organic surface layer. The Bradenton, limestone substratum, soils and the Parkwood Variant soils have an acid surface layer and are underlain by calcareous limestone, which is neutral to moderately alkaline.

Many of the soils have a loamy subsoil. In this category are the Bradenton, Chobee, Delray, EauGallie, Felda, Floridana, Manatee, Palmetto, Wabasso, and Wauchula soils. The Adamsville Variant, Canaveral, Orlando, and Tavares soils have sandy material to a depth of 80 inches or more. The Duette, EauGallie, Myakka, Ona, Pomello, St. Johns, Wabasso, and Wauchula soils have an organically stained layer within the sandy subsurface layer.

Most of the soils have a surface layer that is strongly acid to very strongly acid, and if they have never been limed they require applications of ground limestone to raise the pH level sufficiently for good crop growth. The levels of nitrogen, potassium, and available phosphorus are naturally low in most of these soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, the needs of the crops, and the expected level of yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous. Preparing a good seedbed and tilling are difficult in areas of the Hallandale soils because of limestone near the surface. The same difficulties are encountered on the Bradenton soils and Parkwood Variant soils because of limestone boulders on the surface.

Generally, the structure of the surface layer of most soils in the county is weak. On dry soils that are low in organic matter, intense rainfall causes the colloidal matter to cement, forming a slight crust. When the crust dries, it hardens and becomes slightly impervious to water; thus, it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help to improve soil structure and to reduce crust formation.

The acreage of corn, grain sorghum, sunflowers, and potatoes can be increased under favorable economic conditions.

Rye is the common close-growing crop. Wheat, oats, and triticale also can be grown.

Citrus and tomatoes are the primary special crops grown in the county. Other special crops grown commercially are watermelons, snap beans, cucumbers, and peppers. A small acreage is used for squash, eggplant, cauliflower, nursery plants, and sod production. Under favorable economic conditions, a larger acreage can be used for blueberries, grapes, blackberries, nursery plants, sod, cabbage, cauliflower, turnips, and mustard.

Deep soils that have good natural drainage are especially well suited to citrus. In Manatee County these are the Orlando and Tavares soils; they total about 3,600 acres. With water control, the Bradenton, Chobee, Delray, EauGallie, Felda, Floridana, Gator, Myakka, Okeelanta, Parkwood Variant, Pinellas, St. Johns, Tomoka, Wabasso, and Wauchula soils are suited to vegetables and small fruits.

Most of the well drained and moderately well drained soils in the county are suitable for orchards and nursery

plants. Soils that have poor air drainage and common frost pockets generally are poorly suited to early vegetables, small fruits, and orchards.

The latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pastures in the county are used to produce forage for beef and dairy cattle. Cow-calf operations make up the major livestock enterprise. Bahiagrass, pangolagrass, limpograss (*Hermathria latissima*), and bermudagrass are the major pasture plants grown in the county. Grass seeds or sprigs can be harvested from these grasses for improved pasture plantings as well as for commercial purposes. Many cattlemen oversow pasture with ryegrass in the fall for winter and spring grazing. Hay is harvested from pangolagrass and bermudagrass in summer for feeding in winter.

The moderately well drained and somewhat poorly drained soils, for example, the Adamsville Variant, Cassia, Pomello, Tavares, and Zolfo soils, are well suited to bahiagrass and improved bermudagrass. With good management, hairy indigo and alyce clover can be grown in summer and fall.

If they are drained, the Bradenton, Chobee, Delray, EauGallie, Felda, Manatee, Myakka, Ona, Palmetto, Pinellas, St. Johns, Wabasso, and Wauchula soils are well suited to bahiagrass and limpograss pasture. Subsurface irrigation, where needed, will lengthen the growing seasons and increase forage production. These soils, if adequate amounts of lime and fertilizer are added, are well suited to white clover and other legumes.

Pasture in many parts of the county is greatly depleted by continuous excessive grazing. Yields of pasture are increased with lime, fertilizer, legumes, irrigation, and other management practices.

Differences in the amount and kind of pasture yields are closely related to the kind of soil. Management of pasture is based on the interrelationship of soils, pasture plants, lime, fertilizer, and moisture.

The latest information and suggestions for growing pasture can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Hay and pasture yields predicted under a high level of management for varieties of grasses and legumes suited to the soil are shown in table 3.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 3. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 3 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 4. The capability classification of each map unit is given in the section "Detailed soil map units."

range and grazable woodland

R. Gregory Hendricks, area range conservationist, Soil Conservation Service, helped prepare this section.

Native range plants make up a significant part of the year-round supply of forages for livestock in Manatee County. Range forages are an economical source of feed and are suited to the cow-calf operations that are dominant in this part of the country. About 267,000 acres throughout the survey area are used as native range by livestock. Of this acreage, 160,000 acres are used strictly as range, and 107,000 acres are used as grazable woodland.

The dominant range plant species that grow on a soil are generally the most productive and the most suitable for livestock. They can maintain themselves with a sustained yield so long as the environment is not altered from its natural conditions. Improper use of fire and drainage can alter the natural environment so that range sites do not achieve their potential production. Range plants are grouped in three categories according to their response to grazing: decreasers, increasers, and invaders.

Decreasers generally are the plants most palatable to livestock. They decrease in abundance if the range is under continuous heavy grazing. Increasers are less palatable; under continuous heavy grazing they increase for a while but eventually decrease. Invaders are native to the range in small percentages of the overall plant composition. Invaders have little forage value; they are not palatable to livestock and tend to increase only after other vegetation has been grazed out.

Range condition is a measure of the current productivity of the rangeland in relation to its potential. Four classes are used to evaluate range condition. They are: *excellent*—producing 76 to 100 percent of the potential; *good*—producing 51 to 75 percent of the potential; *fair*—producing 26 to 50 percent of the potential; and *poor*—producing 0 to 25 percent of the potential.

Only about 15 percent of the rangeland in Manatee County is in excellent or good condition, and about 85 percent is in fair or poor condition.

For those soils in the county that are used as or are suited to use as rangeland, table 5 shows the range site and the potential annual production in favorable, normal, and unfavorable years. Potential production is the amount of forage that can be expected to grow on well managed rangeland. Yields are expressed in terms of pounds per acre of air-dry forage for range in excellent condition for favorable, normal, and unfavorable years. Favorable years are those in which climatic factors, such as rainfall distribution and temperature, are favorable for plant growth. Forage refers to total vegetation produced, whether or not it is palatable to grazing animals, and does not reflect forage value or grazing potentials. Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes grasses, forbs, and the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs.

A range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range

sites in the kind, amount, and proportion of range plants. The relationship between soils and vegetation was determined when this survey was made; thus, range sites generally can be determined directly from the soil map. The productivity of a soil is closely related to the natural drainage. The wettest soils, such as those in marshes, produce the greatest amount of vegetation, and the deep, droughty soils in the sandhills normally produce the least forage annually.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Grazable woodland is forest that has an understory of native grasses, legumes, and forbs. The understory is an integral part of the forest plant community. The native plants can be grazed without significantly impairing other forest values. On such forestland, grazing is compatible with timber management if it is controlled or managed in such a manner that timber and forage resources are maintained or enhanced.

Understory vegetation consists of grasses, forbs, shrubs, and other plants used by livestock or by grazing or browsing wildlife. A well managed wooded area can produce enough understory vegetation to supply food to large numbers of livestock and wildlife.

The amount of forage production varies according to the different kinds of grazable woodland; the amount of shade cast by the canopy; the accumulation of fallen needles; the influence of time and intensity of grazing on the herbage; and the number, size, and spacing of tree plantings, as well as the method of site preparation.

The soils in Manatee County are assigned to one of nine range sites. The range sites are Cabbage Palm Hammock, Cabbage Palm Flatwoods, Freshwater Marsh and Ponds, Longleaf Pine-Turkey Oak Hills, Oak Hammock, Sand Pine Scrub, Salt Marsh, Slough, and South Florida Flatwoods. Some soils are not assigned to a range site mainly because they are heavily wooded.

Cabbage Palm Hammock range site. The Bradenton and Parkwood Variant soils (map units 4, 5, and 39) are in this range site. These soils have low potential for producing forage because of the dense canopy of palm trees. The trees provide shade and rest areas for cattle.

Cabbage Palm Flatwoods range site. The Hallandale and Pinellas soils (map units 28 and 40) are in this range site. There are cabbage palm trees throughout the areas. This site is a preferred grazing area because of the high quality and quantity of the forage. Creeping bluestem, chalky bluestem, indiangrass, and various panicums are important in this site.

Freshwater Marsh and Ponds range site. Some of the Delray and Okeelanta soils, Floridana, Immokalee, Gator, Manatee, and Tomoka soils (map units 15, 25, 26, 27, 29, and 47) are in this range site. These soils have potential for producing significant amounts of maidencane. Chalky bluestem and blue maidencane dominate some of the drier edges of this site. The water level fluctuates throughout the year; thus grazing is naturally deferred when the water level is high. Forage production increases during the rest period. This site is preferred by cattle because of the high quantity and quality of the forage.

Longleaf Pine-Turkey Oak Hills range site. The Orlando and Tavares soils (map units 36, 45, and 46) are in this range site. These soils have moderately low potential for producing high quality forage. Natural fertility is low because of the rapid movement of plant nutrients and water through the soil. Because the quantity and quality of forage are poor, cattle do not readily graze this site if other sites are available.

Oak Hammock range site. The soils in the Felda-Palmetto complex (map unit 23) are in this range site. The areas are characterized by a usually dense canopy of large live oak trees and a relatively open understory. The areas are used by cattle primarily for shade and resting.

Sand Pine Scrub range site. The Cassia, Duette, Orsino, and Pomello soils (map units 11, 12, 19, 37, and 42) are in this range site. These soils have limited potential for producing native forage. The plant community consists of a fairly dense stand of sand pine trees and a dense woody understory. Cattle do not graze this site if other sites are available.

Salt Marsh range site. The Okeelanta soil (map unit 34) is in this range site. The soil has potential for producing significant amounts of smooth cordgrass, marshhay cordgrass, seashore saltgrass, and numerous other grasses and forbs for forage. This site can provide good grazing for cattle.

Slough range site. Some of the Delray soils and the Felda and Palmetto soils (map units 16, 22, and 38) are in this range site. These soils have potential for producing significant amounts of blue maidencane, chalky bluestem, and various panicums. Carpetgrass, an

introduced species, tends to become dominant if the site is overgrazed. This site is a preferred grazing area.

South Florida Flatwoods range site. The Adamsville Variant, Braden, and Broward Variant soils, some of the Delray soils, and the EauGallie, Myakka, Ona, Pomona, St. Johns, Wabasso, Wabasso Variant, Wauchula, Waveland, and Zolfo soils (map units 1, 3, 6, 17, 18, 20, 30, 31, 35, 43, 44, 48, 49, 50, 51, 52, 54, and 55) are in this range site. These soils have potential for producing significant amounts of creeping bluestem, indiangrass, chalky bluestem, various panicums, and numerous legumes and forbs. If the site is allowed to deteriorate, sawpalmetto and pineland threeawn become dominant.

woodland management and productivity

Hal E. Brockman, state staff forester, Soil Conservation Service, helped prepare this section.

Approximately 96,000 acres of land in Manatee County is woodland, nearly all of which is privately owned. Most of this acreage is grazed. There is about 1,000 acres of planted pine in the county. The pine trees scattered throughout Manatee County are in areas used primarily as rangeland and are not considered to be woodland.

South Florida slash pine, which grows in the flatwoods, makes up most of the woodland. Part of the forested land is the oak-gum-cypress type, which is dominated by the oak and gum.

South Florida slash pine forest is the most important type in this area. Sand pine grows in a small part of the county, mainly on the sand ridges in the northeastern and central eastern parts of the county. These sand pines do not have high economic value.

A mixed oak and pine forest grows in slightly elevated areas in the flatwoods. A mixed oak and hickory forest grows on the flood plains of the Manatee and Myakka Rivers and Braden Creek. The oak and hickory are not economically valuable as lumber, but they have considerable value for wildlife and for recreation uses. A mixed oak and gum forest grows along several creeks and generally is stocked with valuable sawtimber. These areas may be of more value for the wildlife they harbor and the water resources they protect than for the timber they could produce.

Mangrove forests are of economic value in Manatee County. Four species of mangrove—red, white, black, and buttonwood—and other salt-marsh trees make an important contribution to fisheries. They provide a complex base food chain for growth and development of many saltwater fish and other marine animals.

Housing developments, agriculture, and wildlife have reduced woodland resources in recent years. Many areas that are protected from fire are reverting to pine forest.

Timber management generally consists of natural regeneration following harvest cutting. Prescribed burning is an important management tool. It is used extensively to reduce "rough," which is a dangerous fire hazard, and to help facilitate natural regeneration.

There are several wood-using industries in Manatee County. One small sawmill is located in Myakka City. Pulpwood sold in the county is shipped to mills in other parts of the state. Woodland in Manatee County also has high value for grazing and as food and cover for wildlife and has high esthetic value for recreation. More detailed information about woodland management can be obtained from the local office of the Soil Conservation Service, the Florida Division of Forestry, and the County Extension Service.

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates excessive water in or on the soil, and *s* indicates sandy texture. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: w and s.

In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than

25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index was determined at 25 years for South Florida slash pine and at 50 years for all other species. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet,

are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

John F. Vance, Jr., biologist, Soil Conservation Service, helped prepare this section.

Good wildlife habitat is available in many areas of Manatee County. The wetlands along the Manatee and Myakka Rivers and the mangrove forests along the coast provide particularly valuable habitat.

The primary game is deer, wild turkey, and quail. Populations are good in undeveloped areas. Other game includes squirrels and Florida ducks. Nongame includes raccoon, opossum, armadillo, gray fox, bobcat, otter, mink, skunk, pelican, and a variety of songbirds, woodpecker, shore birds, wading birds, reptiles, and amphibians.

Matters of concern include the changes in habitat caused by urban development in the coastal areas and by intensive agriculture, such as citrus groves and improved pasture. The large acreages of citrus and improved pasture are interspersed with other areas that provide good food and cover for wildlife. Overall, good habitat is available in the rural areas. Some native rangeland could offer better habitat for wildlife if poor grazing and burning practices could be improved. Phosphate mining disrupts large areas of natural habitat; however, good wildlife habitat can be reestablished in these areas by proper reclamation. A potentially greater problem for wildlife is the urban development that is generally associated with the mining operations.

There are a number of endangered and threatened species in Manatee County. They range from the rarely seen red-cockaded woodpecker to more common species, such as the alligator and wood stork. A detailed list of threatened and endangered species as well as information on range and habitat needs is available from the district conservationist at the local Soil Conservation Service office.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, and nature study areas and for farm wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, browntop millet, wheat, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available

water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bahiagrass, lovegrass, Florida beggarweed, clover, and sesbania.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestems, goldenrod, beggarweed, partridgepea, and bristlegrass.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, palmetto, maple, sweetgum, wild grape, hawthorn, viburnum, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are firethorn, wild plum, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cypress, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, dove, meadowlark, field sparrow, cottontail, and armadillo.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, egrets, herons, shore birds, otter, and water rat.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section (tables 13, 14, and 15).

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils. Additional testing and analysis by personnel experienced in the design and construction of engineering works may be necessary.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of

construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Soil erosion is a problem in disturbed areas. Water erosion can damage the soils if rains are intense and the soils are bare of vegetation and surface mulch.

Grading removes topsoil and may expose the loamy subsoil of the Braden, Bradenton, Canova, Chobee, Delray, EauGallie, Felda, Floridana, Manatee, Parkwood Variant, Wabasso, and Wauchula soils. Ripping the exposed subsoil and covering it with less erodible topsoil helps to reduce erosion.

Erosion control practices provide protective cover, reduce runoff, and increase the infiltration of water. Diversions and contouring reduce the length of slope and reduce runoff and erosion. They are most practical on soils that have uniform slopes.

Soil blowing is a major hazard on sandy soils. Wind erosion can damage soils in a few hours in open, unprotected areas if the winds are strong and the soil is dry and bare of vegetation and surface mulch. Blowing soil can cause problems for drainage ditches, roads, fences, and equipment, and it can cause health problems by polluting the air.

Maintaining plant cover and surface mulch minimizes soil blowing. Windbreaks of adapted trees and shrubs and buffer strips of small grains are effective in reducing wind erosion.

Clearing and distributing the minimum area necessary for construction helps to reduce water runoff and soil

blowing. Mulching helps to reduce damage from water runoff and soil blowing and improves moisture conditions for seedlings.

Information for the design of erosion control practices for each kind of soil is available in local offices of the Soil Conservation Service.

sanitary facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter in the soil is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both the trench and area types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover

for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing and seepage.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Therefore, material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; and subsidence of organic layers. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and

organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 14, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

In table 15, some soils are assigned to two hydrologic soil groups. Soils that have a seasonal high water table but can be drained are assigned first to a hydrologic soil group that denotes the drained condition of the soil and then to a hydrologic group that denotes the undrained condition, for example, A/D and B/D. Because there are different degrees of drainage and water table control, onsite investigation is needed to determine the hydrologic group of the soil in a particular location.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall and water in swamps and marshes are not considered flooding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil and the soil is ponded. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*11*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 16, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Spodosol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquod (*Aqu*, meaning water, plus *od*, from Spodosol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquod (*Hapl*, meaning minimal horizonation, plus *aquod*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquods.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, siliceous, hyperthermic Typic Haplaquods.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*9*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*11*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Adamsville Variant

Adamsville Variant soils are somewhat poorly drained and rapidly permeable. They formed in thick beds of sandy marine sediment. These soils are nearly level and are on low ridges that are slightly higher than the surrounding flatwoods. Slopes are 0 to 2 percent. In most years, if the soils are not drained, the water table is at a depth of 20 to 40 inches for 2 to 6 months of the year. In some years, it is at a depth of 10 to 20 inches for periods of up to 2 weeks. In most years, it is within a depth of 60 inches for more than 9 months of the year.

These soils are siliceous, hyperthermic Humaqueptic Psammaquents.

Adamsville Variant soils are near Cassia, Myakka, Ona, Orlando, and St. Johns soils. Cassia, Myakka, Ona, and St. Johns soils have a spodic horizon, and all except Cassia and Orlando soils are poorly drained. Cassia soils are somewhat poorly drained and moderately well drained, and Orlando soils are moderately well drained.

Typical pedon of Adamsville Variant fine sand, in an orange grove, about one-fourth of a mile south of the Hillsborough County line and about 700 feet west of U.S. Highway 301, NW1/4NE1/4 sec. 3, T. 33 S., R. 19 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine and common medium roots; strongly acid; clear smooth boundary.

C1—8 to 16 inches; grayish brown (10YR 5/2) fine sand; common coarse distinct light gray (10YR 6/1) and few medium distinct light yellowish brown (10YR 6/4) mottles; single grained; loose; common fine roots; strongly acid; gradual wavy boundary.

C2—16 to 29 inches; very pale brown (10YR 7/4) fine sand; common medium and coarse faint brownish yellow (10YR 6/6) mottles; single grained; loose; few fine roots; strongly acid; gradual wavy boundary.

C3—29 to 43 inches; light gray (10YR 7/2) fine sand; common medium and fine distinct yellowish brown (10YR 5/4) mottles; single grained; loose; few fine roots; strongly acid; gradual wavy boundary.

C4—43 to 80 inches; light gray (10YR 7/1) fine sand; few fine faint light brownish gray and very pale brown mottles; single grained; loose; strongly acid.

These soils are fine sand or sand throughout except for the A1, or Ap, horizon, which is fine sand. Reaction is strongly acid or very strongly acid throughout.

The A1, or Ap, horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It ranges from 6 to 10 inches in thickness.

The C1 horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or 3 and has mottles or has value of 1 with or without mottles. The rest of the C horizon has hue of 10YR, value of 5 to 8, and chroma of 1 to 4. In most pedons, chroma of 1 or 2 is dominant in the lower part of the C horizon. In most pedons the C horizon is mottled in shades of gray, yellow, and brown.

Anclote series

The Anclote series consists of very poorly drained, rapidly permeable soils that formed in deep deposits of sandy marine sediment. These soils are nearly level and are in freshwater swamps and poorly defined drainageways. Slopes are less than 2 percent. In most years, the soils are ponded or the water table is at or near the soil surface for 9 months or more of the year. These soils are sandy, siliceous, hyperthermic Typic Haplaquolls.

Anclote soils are near Canova, Okeelanta, Floridana, Manatee, and Chobee soils in swamps and drainageways and Myakka, Wauchula, EauGallie, Waveland, and Bradenton soils in the surrounding flatwoods and hammocks. All the associated soils in swamps except Okeelanta soils have an argillic horizon. Okeelanta soils are organic. The associated soils in flatwoods are better drained than the Anclote soils and have a spodic horizon. Bradenton soils are better drained and have an argillic horizon.

Typical pedon of Anclote fine sand, in an area of Canova, Anclote, and Okeelanta soils, in woodland, about 2 miles southeast of Parish, SW1/4SW1/4 sec. 27, T 33 S., R. 19 E.

A1—0 to 16 inches; black (10YR 2/1) fine sand; weak medium granular structure; very friable; many fine and common medium roots; high organic matter content; slightly acid; clear wavy boundary.

C1g—16 to 22 inches; grayish brown (10YR 5/2) fine sand; common medium distinct very dark gray (10YR 3/1) mottles; single grained; loose; neutral; gradual wavy boundary.

C2g—22 to 68 inches; gray (10YR 5/1) fine sand; few fine distinct streaks of dark gray (10YR 4/1); single grained; loose; neutral; gradual wavy boundary.

C3g—68 to 80 inches; light gray (10YR 7/1) fine sand; single grained; loose; neutral.

Reaction ranges from medium acid to mildly alkaline throughout. The content of silt and clay in the 10- to 40-inch control section is less than 15 percent.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2; or it has no hue (N), and value is 2 or 3; or it has hue of 2.5Y, value of 3, and chroma of 2. It ranges from 10 to 20 inches in thickness.

The C horizon has hue of 10YR or 5Y, value of 5 to 7, and chroma of 1 where there may or not be any mottles or chroma of 2 where there are mottles. It is sand or fine sand. The sand grains are dominantly uncoated.

Braden series

The Braden series consists of somewhat poorly drained, moderately permeable soils that formed in alluvial sandy and loamy sediments. The soils are mainly nearly level and are on stream terraces well above normal overflow. Slopes are smooth and range from 0 to 3 percent. In most years, the water table is at a depth of 30 to 40 inches for 1 to 3 months out of the year. It rises to a depth of less than 30 inches briefly during periods of heavy rainfall. The soils are flooded rarely for brief periods following abnormally high rainfall. These soils are loamy, siliceous, hyperthermic Arenic Hapludults.

Braden soils are near Cassia, EauGallie, Myakka, Pomello, Wabasso, Wauchula, and Zolfo soils. All of

these soils have a spodic horizon. EauGallie, Myakka, Wabasso, and Wauchula soils are poorly drained, and Pomello soils are moderately well drained. Cassia, Pomello, and Zolfo soils have a spodic horizon and are sandy to a depth of 80 inches or more.

Typical pedon of Braden fine sand, in woodland, about 2 miles southwest of Lorraine and three-fourths of a mile south of Florida Highway 70, NW1/4SW1/4 sec. 21, T. 35 S., R. 19 E.

A1—0 to 4 inches; very dark gray (10YR 3/1) rubbed fine sand; weak fine granular structure; very friable; common fine roots; very strongly acid; clear smooth boundary.

A21—4 to 6 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; common fine roots; very strongly acid; clear wavy boundary.

A22—6 to 10 inches; brown (10YR 5/3) fine sand; single grained; loose; few fine roots; very strongly acid; clear wavy boundary.

A23—10 to 18 inches; dark brown (10YR 4/3) fine sand; single grained; loose; few fine roots; strongly acid; clear wavy boundary.

A24—18 to 24 inches; light yellowish brown (10YR 6/4) fine sand; common fine faint very pale brown mottles; single grained; loose; very strongly acid; gradual wavy boundary.

B1—24 to 28 inches; yellow (10YR 7/6) fine sand; common fine distinct strong brown (7.5YR 5/6) segregated iron mottles; single grained; loose; very strongly acid; clear wavy boundary.

B21t—28 to 36 inches; yellowish brown (10YR 5/8) fine sandy loam; common fine and medium distinct light gray (10YR 7/1; 7/2) and common fine faint strong brown and yellowish red mottles; weak coarse subangular blocky structure; friable; sand grains bridged and coated with clay; extremely acid; gradual wavy boundary.

B22t—36 to 40 inches; yellowish brown (10YR 5/8) fine sandy loam; many medium distinct light gray (10YR 7/2) and common fine faint strong brown and yellowish red mottles; weak coarse subangular blocky structure; friable; sand grains coated and bridged with clay; few thin lenses of loamy fine sand; extremely acid; gradual wavy boundary.

B3—40 to 44 inches; very pale brown (10YR 7/4) loamy fine sand; many medium distinct light gray (10YR 7/2) and many fine faint strong brown mottles; moderate medium granular structure; very friable; extremely acid; clear wavy boundary.

C1g—44 to 50 inches; light gray (10YR 7/2) fine sand; few fine distinct brownish yellow (10YR 6/8) mottles; single grained; loose; extremely acid; gradual wavy boundary.

C2g—50 to 55 inches; light brownish gray (10YR 6/2) fine sand; few medium faint light gray (10YR 7/2) mottles; single grained; loose; clear wavy boundary.

C3g—55 to 70 inches; gray (10YR 5/1) sand; many coarse distinct light gray (10YR 7/2) mottles; single grained; loose; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. The A horizon is very strongly acid or strongly acid. The Bt and C horizons range from extremely acid to strongly acid.

The A1, or Ap, horizon has hue of 10YR, value of 2, and chroma of 1 or value of 3 or 4 and chroma of 1 to 3. It is less than 10 inches thick where value is 3 or less and chroma is 2 or 1.

The A21 horizon has hue of 10YR, value of 5 to 7, and chroma of 2. The A22 to A24 horizons have hue of 10YR, value of 5 or 6, and chroma of 3 to 6; or value of 4 and chroma of 3 or 4; or value of 7 and chroma of 3 or 4. In some pedons there are few to common mottles or splotches of uncoated sand grains that have chroma of 2 or 1. The A horizon is sand or fine sand. There is no A21 horizon in some pedons.

The B1 horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 8. It is sand, fine sand, loamy sand, or loamy fine sand. There is no B1 horizon in some pedons.

The B2t horizon has hue of 10YR, value of 5 to 7, and chroma of 3 to 8; or hue of 7.5YR, value of 5, and chroma of 4 or 6; or value of 6 and chroma of 4 to 8 and few to many mottles that have chroma of 2 or less. There are mottles of higher value and chroma in many pedons. The horizon is sandy loam, fine sandy loam, or sandy clay loam. In some pedons there are a few streaks or lenses of coarser textured material. The mottles that have chroma of 2 are at a depth of less than 30 inches. They indicate wetness.

In some pedons the lower part of the B2t horizon has hue of 10YR, value of 4 to 7, and chroma of 2 or 1; or hue of 2.5Y, value of 4 to 7, and chroma of 2; or hue of 5Y, value of 5 or 6, and chroma of 1; or it has no hue (N), value is 4 to 7, and in some pedons, there are mottles of red, yellow, brown, or gray. The texture is sandy loam, fine sandy loam, or sandy clay loam.

The B3 horizon has hue, value, and chroma that are similar to those of the B2t horizon. It ranges from fine sandy loam to loamy sand. There is no B3 horizon in some pedons.

The Cg horizon has hue, value, and chroma similar to those of the lower part of the B2t horizon. It is sand or fine sand.

Bradenton series

The Bradenton series consists of poorly drained, moderately permeable soils that formed in unconsolidated loamy marine sediment underlain by marl and, in some places, hard limestone. The soils are nearly level and are on low-lying ridges and hammocks. Slopes are generally smooth and are less than 2 percent. In most years, if the soils are not drained, the water table is

within 10 inches of the surface for 2 to 6 months out of the year and at a depth of 10 to 40 inches for much of the rest of the year. In dry periods the water table recedes to a depth below 40 inches. These soils are coarse-loamy, siliceous, hyperthermic Typic Ochraqualfs.

Bradenton soils are near Chobee, Delray, EauGallie, Felda, Floridana, Manatee, Wabasso, and Waveland soils. Chobee soils are fine-loamy. Delray and Floridana soils have a mollic epipedon and an A horizon that is more than 20 inches thick. EauGallie, Wabasso, and Waveland soils have a spodic horizon. Felda soils have an A horizon that is 20 to 40 inches thick. Manatee soils have a mollic epipedon.

Typical pedon of Bradenton fine sand, in a hardwood-cabbage palm hammock, about one-eighth mile east of the Sarasota County line along the north boundary of the Myakka River State Park, SW1/4NW1/4 sec. 6, T. 37 S., R. 21 E.

A1—0 to 4 inches; dark gray (10YR 4/1) fine sand; moderate medium granular structure; very friable; many fine and medium roots; medium acid; clear smooth boundary.

A2—4 to 9 inches; grayish brown (10YR 5/2) fine sand; few medium distinct dark gray (10YR 4/1) mottles; single grained; loose; many fine and medium roots; medium acid; abrupt wavy boundary.

B21tg—9 to 20 inches; dark gray (10YR 4/1) fine sandy loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; few thin discontinuous clay films on surface of peds; slightly acid; gradual wavy boundary.

B22tg—20 to 27 inches; gray (10YR 5/1) fine sandy loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few thin discontinuous clay films on surface of peds; common soft white calcium carbonate accumulations; mildly alkaline; gradual wavy boundary.

B3g—27 to 38 inches; gray (10YR 5/1) loamy fine sand; weak coarse subangular blocky structure; very friable; many sand grains coated with white calcium carbonate, few white calcium carbonate nodules; mildly alkaline, calcareous; clear wavy boundary.

C—38 to 80 inches; light gray (10YR 7/1) marl that has texture of loamy fine sand; massive; friable; moderately alkaline, calcareous.

The solum ranges from 20 to 50 inches in thickness.

The A1, or Ap, horizon has hue of 10YR, value of 2 to 4, and chroma of 1; or it has no hue (N) and value of 2 to 4. It ranges from medium acid to neutral and ranges from 4 to 6 inches in thickness.

The A2 horizon has hue of 10YR, value of 4 to 7, and chroma of 1; or value of 5 to 7 and chroma of 2; or it has no hue (N) and value of 4 to 7 and mottles of gray, brown, or yellow. Reaction ranges from medium acid to neutral. The total thickness of the A horizon is less than 20 inches.

The B2tg horizon has hue of 10YR, value of 4 to 7, and chroma of 1; or hue of 10YR or 2.5Y, value of 3 to 7, and chroma of 2; or it has no hue (N) and value of 4 to 7 and, in places, mottles of brown, yellow, or red. The horizon is sandy loam or fine sandy loam, and it ranges from slightly acid to mildly alkaline. In many pedons the lower part of the horizon has soft calcium carbonate accumulations and nodules. The B3g horizon is similar in color to the B2tg horizon. It is loamy sand or loamy fine sand and is mildly alkaline or moderately alkaline. In some places there is no B3g horizon.

The C horizon has hue of 10YR to 5GY, value of 5 to 8, and chroma of 2 or 1. It is predominantly marl that has texture of loamy sand or loamy fine sand. However, in some pedons the C horizon is a mixture of shells, shell fragments, and sand.

In some pedons a layer of limestone about 1.5 to 3 feet thick underlies the Btg, B3g, or C horizons at a depth between 40 and 80 inches. The limestone can be dug with a backhoe. It has few to common solution holes or fractures. Below the limestone there is variable sand to sandy clay loam mixed with shells and shell fragments.

Broward Variant

Broward Variant soils are poorly drained and moderately permeable. They formed in sandy marine sediment overlying limestone. These soils are nearly level and are in moderately large to small areas of flatwoods, mainly in the western part of the county. Slopes are 0 to 2 percent. In most years, if the soils are not drained, the water table is between depths of 10 and 40 inches for more than 6 months of the year. It is at a depth of less than 10 inches for 1 to 4 months in wet seasons and recedes to a depth below 40 inches in very dry seasons. These soils are sandy, siliceous, hyperthermic Entic Haplaquods.

Broward Variant soils are near Chobee, Delray, EauGallie, Myakka, and Wabasso Variant soils. All the associated soils except Wabasso Variant soils do not have limestone within a depth of 80 inches. Chobee and Delray soils have a mollic epipedon, do not have a spodic horizon, and have an argillic horizon. EauGallie soils have an argillic horizon below a depth of 40 inches. Myakka soils have a spodic horizon that is better developed than that of Broward Variant soils. Wabasso Variant soils have an argillic horizon between the spodic horizon and limestone.

Typical pedon of Broward Variant fine sand, in a partly cleared area, about 2 miles west of Oneco and about 1,000 feet north of 53rd Ave., SW1/4SW1/4 sec. 11, T. 35 S., R. 17 E.

A1—0 to 6 inches; very dark gray (10YR 3/1) rubbed fine sand, unrubbed material is a mixture of black organic matter and light gray sand grains; weak fine granular structure; very friable; many fine and common medium roots; very strongly acid; clear wavy boundary.

A2—6 to 14 inches; light gray (10YR 6/1) fine sand; few medium distinct dark gray (10YR 4/1) verticle streaks; single grained; loose; few fine and medium roots; strongly acid; clear wavy boundary.

B2h—14 to 20 inches; very dark brown (10YR 2/2) fine sand; moderate medium granular structure; friable; most sand grains are coated with collodial organic matter; few fine and medium roots mostly at upper boundary; slightly acid; gradual wavy boundary.

B3—20 to 27 inches; brown (10YR 4/3) fine sand; weak medium granular structure; very friable; many uncoated sand grains; neutral; gradual wavy boundary.

C1—27 to 34 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; mildly alkaline; abrupt wavy boundary.

IIR—34 to 55 inches; hard limestone that can be chipped but not dug with a spade.

IIIC2g—55 to 80 inches; light gray (10YR 7/1) fine sand; few to common distinct mottles of yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6); single grained; loose; moderately alkaline.

The A1, or Ap, horizon has hue of 10YR, value of 2, and chroma of 1; or value of 3 or 4 and chroma of 1 or 2. It is less than 8 inches thick.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 5 or 6, and chroma of 2. Total thickness of the A horizon is less than 30 inches. The A horizon is sand or fine sand throughout except the A1, or Ap, horizon, which is fine sand. Reaction in the A horizon ranges from very strongly acid to slightly acid.

The B2h horizon has hue of 10YR, value of 2, and chroma of 1; or value of 3 and chroma of 2 or 3; or hue of 5YR, value of 3, and chroma of 2 to 4; or hue of 7.5YR, value of 3, and chroma of 2. The horizon is sand, fine sand, or loamy fine sand. It ranges from 4 to 8 inches in thickness. The B3 horizon has hue of 10YR, value of 4, and chroma of 3 or 4; or hue of 7.5YR, value of 4, and chroma of 2 to 4; or hue of 5YR, value of 4, and chroma of 3 or 4. There is no B3 horizon in some pedons. Reaction in the B horizon ranges from very strongly acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 3 or less. It is sand or fine sand.

The IIR horizon is limestone of varying degrees of hardness. It is at a depth of less than 40 inches. Commonly, it can be chipped but not dug with a hand spade. It can be dug using power machinery. It varies greatly in thickness within short distances but is generally a ledge about 12 to 30 inches thick.

The IIICg horizon has hue of 10YR to 5GY, value of 5 to 7, and chroma of 3 or less and, in some pedons, has mottles. It is sand, fine sand, or loamy fine sand and is mildly alkaline or moderately alkaline.

Canaveral series

The Canaveral series consists of nearly level to gently sloping, somewhat poorly drained to moderately well drained sandy soils in areas of low dunes near the coast. The soils formed in thick beds of marine sand and shell fragments. In most years, if the soils are not drained, the water table is within 10 to 40 inches of the surface for 2 to 6 months or more of the year. It recedes to a depth of 50 inches or more during dry periods. Slopes range from 0 to 5 percent. These soils are hyperthermic, uncoated Aquic Quartzipsamments.

Canaveral soils are near Beaches and Myakka soils. Canaveral soils are better drained than Beaches and are in dunelike positions adjacent to Beaches. Canaveral soils differ from Myakka soils in that Canaveral soils are better drained, contain many shell fragments, and do not have a spodic horizon.

Typical pedon of Canaveral fine sand, 0 to 5 percent slopes, east of the beach on Anna Maria Key, SE1/4SE1/4 sec. 18, T. 34 S., R. 16 E.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; mildly alkaline; gradual smooth boundary.

C1—6 to 17 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; mildly alkaline; abrupt wavy boundary.

C2—17 to 34 inches; light yellowish brown (10YR 6/4) fine sand mixed with multicolored shell fragments; single grained; loose; about 45 percent by volume shell fragments ranging to 3 mm; moderately alkaline; gradual wavy boundary.

C3—34 to 65 inches; very pale brown (10YR 7/4) shell fragments; single grained; loose; about 60 percent by volume shell fragments ranging to 3 mm; moderately alkaline.

Reaction ranges from neutral to moderately alkaline throughout.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It ranges from 1 to 8 inches in thickness. It is fine sand or sand.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. It extends to a depth of more than 65 inches. It is sand or fine sand. In some pedons the sand is mixed with broken shell fragments, but in most pedons the sand and shell fragments are stratified. The content of shell fragments ranges from 15 to 60 percent.

In some places the soils consist of mixed sand and shells that have been dredged or excavated from areas

of water and deposited on low-lying mineral soils. In other places the soils consist of dredged or excavated material that has been deposited over organic soil material in tidal marsh.

Canova series

The Canova series consists of very poorly drained, moderately permeable soils that formed in loamy marine material under conditions favorable for the accumulation of organic material. The soils are nearly level and are in freshwater swamps and poorly defined drainageways. Slopes are less than 2 percent. In most years, the soils are ponded, or the water table is at or near the surface for 9 months or more of the year. These soils are fine-loamy, siliceous, hyperthermic Typic Glossaqualfs.

Canova soils are near Anclote, Chobee, Floridana, Manatee, and Okeelanta soils in swamps and drainageways and EauGallie, Bradenton, Myakka, Wauchula, and Waveland soils in surrounding flatwoods. Anclote, Chobee, Floridana, and Manatee soils have a mollic epipedon. Okeelanta soils are organic. EauGallie, Myakka, Wauchula, and Waveland soils are better drained than Canova soils and have a spodic horizon. Bradenton soils are better drained and do not have a histic epipedon.

Typical pedon of Canova muck, in an area of Canova, Anclote, and Okeelanta soils, in woodland, about 2 miles southeast of Parish, SW1/4SW1/4 sec. 27, R. 33 S., T. 19 E.

Oa—0 to 8 inches; dark reddish brown (5YR 2/2) rubbed muck; about 15 percent fiber, 5 percent rubbed; weak medium granular structure; very friable; many fine and common medium roots; slightly acid; abrupt smooth boundary.

A1—8 to 17 inches; dark gray (10YR 4/1) fine sand; single grained; loose; few fine roots; few medium very dark gray (10YR 3/1) streaks; slightly acid; gradual wavy boundary.

A2—17 to 24 inches; gray (10YR 6/1) fine sand; few medium distinct dark gray (10YR 4/1) streaks; single grained; loose; few fine roots; slightly acid; abrupt irregular boundary.

B21tg&A—24 to 34 inches; gray (10YR 5/1) sandy clay loam and few coarse distinct tongues of dark gray (10YR 4/1) sand and few medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; sand grains coated and bridged with clay; mildly alkaline; gradual wavy boundary

B22tg—34 to 45 inches; gray (10YR 5/1) sandy clay loam; common medium distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; friable; sand grains coated and bridged with clay; mildly alkaline; gradual wavy boundary.

B31g—45 to 63 inches; gray (10YR 6/1) sandy clay loam; few fine and medium faint light gray (10YR 7/1) calcium carbonate accumulations and few fine distinct dark yellowish brown mottles; massive; friable; few lenses and pockets of fine sandy loam and sandy loam; moderately alkaline, calcareous; gradual wavy boundary.

B32g—63 to 68 inches; gray (5Y 6/1) fine sandy loam with common fine and medium distinct light gray (10YR 7/1) calcium carbonate accumulations; massive; friable; moderately alkaline, calcareous.

Reaction is medium acid or slightly acid in the Oa horizon, slightly acid to moderately alkaline in the A horizon, and mildly alkaline or moderately alkaline in the B2t horizon. The B3g horizon is calcareous.

The Oa horizon has hue of 5YR, value of 2, and chroma of 1 or 2; or value of 3 and chroma of 2 or 3; or hue of 10YR, value of 2, and chroma of 1; or hue of 7.5YR, value of 3, and chroma of 2; or it has no hue (N), and value is 2. In some pedons this horizon consists of fibric or hemic material. It ranges from 5 to 16 inches in thickness.

The A1 horizon has no hue (N) or has hue of 10YR; value is 4 to 6, and chroma is 0 or 1; or it has hue of 10YR or 2.5Y, value of 5, and chroma of 2. It is fine sand or sand and ranges from 7 to 13 inches in thickness.

The A2 horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 0 or 1; or it has hue of 10YR or 2.5Y, value of 7, and chroma of 2. There are few to common mottles or streaks with higher or lower values. This horizon ranges from 4 to 9 inches in thickness. It is sand or fine sand.

The B21tg part of the B21tg&A horizon and the B22tg horizon have no hue (N) or have hue of 10YR or 5Y; value is 4 to 6, and chroma is 0 or 1. They have mottles in shades of yellow and brown. They are dominantly sandy clay loam but range to sandy loam or sandy clay loam in the upper part. The A part of the B21tg&A horizon has no hue (N) or has hue of 10YR; value is 4 to 7, and chroma is 0 or 1. It is sand or fine sand.

The B3g horizon has about the same color range as that of the B2tg horizon. It is sandy loam, fine sandy loam, or sandy clay loam and has lenses and pockets of sand, loamy sand, or loamy fine sand. There are few to common, fine to medium light gray and white fragments of calcium carbonate material.

Cassia series

The Cassia series consists of somewhat poorly drained and moderately well drained soils that formed in thick deposits of marine sand. Permeability is moderate to moderately rapid. The soils are nearly level and are on low to moderately high ridges and knolls that are scattered throughout the flatwoods. In most years, if the

soils are not drained, the water table is at a depth of 15 to 40 inches for about 6 months of the year and below a depth of 40 inches during dry periods. In some areas the water table is at a depth of 40 to 60 inches for 1 to 4 months of the year; it rises to within 40 inches of the surface for less than 2 weeks during very wet seasons and recedes to a depth of more than 60 inches during dry periods. Slopes are 0 to 2 percent. These soils are sandy, siliceous, hyperthermic Typic Haplohumods.

Cassia soils are near EauGallie, Immokalee, Myakka, Pomello, and Waveland soils. EauGallie, Immokalee, Myakka, and Waveland soils are poorly drained and are in slightly lower positions on the landscape than Cassia soils. EauGallie soils have an argillic horizon. Immokalee and Pomello soils have a spodic horizon between depths of 30 and 50 inches.

Typical pedon of Cassia fine sand, in a wooded area, 2 miles southeast of Duette, SE1/4NE1/4 sec. 14, T. 34 S., R. 22 E.

A1—0 to 3 inches; gray (10YR 5/1, rubbed) fine sand; single grained; loose; many fine roots; very strongly acid; clear smooth boundary.

A21—3 to 7 inches; light gray (10YR 7/1) fine sand; single grained; loose; few fine roots; very strongly acid; clear wavy boundary.

A22—7 to 24 inches; white (N 8/0) fine sand; single grained; loose; very strongly acid; abrupt smooth boundary.

B21h—24 to 27 inches; black (5YR 2/1) fine sand; massive parting to moderate fine granular; firm; sand grains coated with organic matter; very strongly acid; clear wavy boundary.

B22h—27 to 33 inches; dark reddish brown (5YR 3/3) fine sand; few very dark brown (10YR 2/2) and black (5YR 2.5/1) medium pockets; massive parting to moderate fine granular; firm; sand grains coated with organic matter; very strongly acid; clear wavy boundary.

C—33 to 80 inches; very pale brown (10YR 7/3) fine sand, light gray (10YR 7/1) in the lower part; common medium faint brown (10YR 5/2) and dark grayish brown (10YR 4/2) mottles and few fine distinct very dark gray mottles; single grained; loose; very strongly acid.

Reaction ranges from very strongly acid to medium acid.

The A1 horizon has no hue (N) or has hue of 10YR; the value is 5 through 7, and chroma is 1 or 0. Unrubbed material has a salt and pepper appearance. Thickness ranges from 2 to 5 inches.

The A2 horizon has no hue (N) or has hue of 10YR; the value is 6 through 8, and chroma is 1 or 0. In some pedons, this horizon is mottled gray, yellow, and brown. Many pedons have a transitional horizon one-half inch to 2 inches thick that has no hue (N) or has hue of 10YR; value is 2 through 4, and chroma is 2 to 0. The combined thickness of the A1 and A2 horizons ranges from 20 to 30 inches.

The Bh horizon has no hue (N) or has hue of 10YR or 7.5YR; value is 2 through 4, and chroma is 4 to 0. The horizon is fine sand, loamy fine sand, or loamy sand and is 9 to 20 inches thick. Some pedons have a B3 horizon that has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4.

The C horizon has hue of 10YR, value of 5 through 7, and chroma of 1 through 4. It has mottles in shades of gray, brown, and yellow. Its texture is fine sand or sand.

Chobee series

The Chobee series consists of very poorly drained soils that formed in thick beds of moderately fine textured marine sediment. Permeability is slow or very slow. The soils are nearly level and are in small to large depressions, poorly defined drainageways, and broad low flats. In most years, if the soils are not drained, the water table is within 10 inches of the surface for 6 months or more out of the year. In most places, slopes are less than 1 percent, but they range to 2 percent. These soils are fine-loamy, siliceous, hyperthermic Typic Argiaquolls.

Chobee soils are near Bradenton, Delray, EauGallie, Felda, Myakka, Palmetto, Parkwood Variant, and Wabasso soils. Bradenton, Felda, and Palmetto soils do not have a mollic epipedon. Felda soils have an A horizon 20 to 40 inches thick. Palmetto soils have an A horizon 40 to 80 inches thick and a low base saturation. Delray soils have an A horizon 40 to 80 inches thick. EauGallie, Myakka, and Wabasso soils have a spodic horizon. Parkwood Variant soils have a thinner, dark colored epipedon and are calcareous throughout.

Typical pedon of Chobee loamy fine sand, in an improved pasture, about 5 miles east of Piney Point and one-half mile south of the Hillsborough County line, NE1/4SW1/4 sec. 1, T. 33 S., R. 18 E.

Ap—0 to 8 inches; black (10YR 2/1) loamy fine sand; few fine distinct gray fine sand pockets; moderate medium granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

B21t—8 to 24 inches; very dark gray (10YR 3/1) sandy clay loam; common, medium, distinct gray (10YR 5/1) sand streaks; weak coarse subangular blocky structure; friable; slightly sticky and slightly plastic; common fine roots; sand grains coated and bridged with clay; mildly alkaline; gradual wavy boundary.

B22tca—24 to 44 inches; very dark gray (10YR 3/1) sandy clay loam; weak coarse subangular blocky structure; friable; sticky and plastic; few fine roots; many soft white calcium carbonate accumulations; sand grains coated and bridged with clay; moderately alkaline, calcareous; gradual wavy boundary.

B23tca—44 to 51 inches; dark gray (10YR 4/1) sandy clay loam; few fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; friable; sticky and plastic; sand grains coated and bridged with clay; many fine and medium white calcium carbonate accumulations; moderately alkaline, calcareous; gradual wavy boundary.

B3g—51 to 63 inches; gray (10YR 5/1) fine sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; common calcium carbonate nodules; moderately alkaline, calcareous; gradual wavy boundary.

Cg—63 to 80 inches; gray (10YR 6/1) loamy fine sand and fine sand; massive; very friable; few small calcium carbonate nodules; moderately alkaline, calcareous.

The solum is more than 40 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction ranges from slightly acid to moderately alkaline. Thickness ranges from 4 to 18 inches.

The B2t and B2tca horizons have no hue (N) or have hue of 10YR; value is 2 through 5, and chroma is 1 or 0; or they have hue of 5YR, value of 4 through 6, and chroma of 1 or 2 and, in some pedons, mottles of gray or brown; or they have hue of 2.5Y, value of 4 or 5, and chroma of 2 and mottles. Texture is sandy loam or sandy clay loam. Clay content in the upper 20 inches of the argillic horizon ranges from 18 to 35 percent. In the Btca horizon, reaction ranges from neutral to moderately alkaline and calcareous.

The B3g horizon has the same color range as the B2t and B2tca horizons. Its texture is sandy loam or fine sand loam. The horizon has pockets or lenses of coarser material in some places.

The Cg horizon has hue of 10YR, value of 5 through 7, and chroma of 1; hue of 2.5Y, value of 5 through 7, and chroma of 2; hue of 5Y, value of 5 through 7, and chroma of 1 or 2; or hue of 5GY, value of 5 or 6, and chroma of 1 and, in some pedons, mottles. Its texture ranges from fine sand or loamy fine sand to clay loam. Reaction ranges from neutral to moderately alkaline and calcareous. There are shell fragments in some pedons.

Chobee Variant

Chobee Variant soils are very poorly drained, slowly permeable soils that formed in thick beds of alkaline loamy marine sediment. These soils are nearly level and are in shallow depressions mainly in the western part of the county. The water table is at a depth of less than 10 inches for 6 months or more of the year. Undrained areas pond for long periods. Slopes range from 0 to 2 percent. These soils are fine-loamy, carbonatic, hyperthermic Typic Haplaquolls.

Chobee Variant soils are near Bradenton, Chobee, Felda, and Manatee soils. Bradenton soils do not have a mollic epipedon and are poorly drained. Chobee soils have an argillic horizon. Felda soils are poorly drained and have an argillic horizon below a depth of 20 inches. Manatee soils have a sandy loam argillic horizon.

Typical profile of Chobee Variant sandy clay loam, in a wooded area, 100 feet east of Cedar Drain and one-half mile south of Atlantic Coast Line Railroad, SE1/4NE1/4 sec. 28, T. 33 S., R. 18 E.

A11—0 to 13 inches; black (10YR 2/1) sandy clay loam; weak medium subangular blocky structure; firm; high in organic matter; few fine and medium roots; neutral; clear wavy boundary.

A12—13 to 20 inches; very dark gray (10YR 3/1) sandy clay loam; weak medium subangular blocky structure; common fine faint very dark grayish brown mottles; firm; few fine and medium roots; neutral; clear wavy boundary.

B2gca—20 to 35 inches; light gray (10YR 7/2) sandy clay loam; common fine distinct dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; sticky; soft accumulations of calcium carbonate; moderately alkaline, calcareous; clear wavy boundary.

B3gca—35 to 40 inches; light gray sandy loam; common medium distinct yellow (10YR 7/6) mottles; weak fine subangular blocky structure; slightly sticky; soft accumulations of calcium carbonate; moderately alkaline, calcareous; clear wavy boundary.

C1g—40 to 70 inches; light gray (10YR 7/2) loamy sand; weak medium granular structure; few fine shell fragments; very friable; moderately alkaline, calcareous; clear wavy boundary.

C2g—70 to 80 inches; mixed light gray (10YR 7/2) and brownish yellow (10YR 6/6) sand; single grained; loose; common shell fragments; moderately alkaline, calcareous.

The solum ranges from 35 to 60 inches in thickness. Base saturation is 50 percent or more in all horizons. The mollic epipedon is 10 to 24 inches thick.

The A horizon has no hue (N) or has hue of 10YR; value is 2 or 3, and chroma is 1 or 0. Reaction ranges from medium acid to neutral.

The Bgca horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 2 to 0. The texture is mainly sandy clay loam or sandy clay but ranges to sandy loam in the lower part. The content of clay in the

10- to 40-inch control section averages 20 to 35 percent. Reaction is mildly alkaline or moderately alkaline. There are few to common mottles in shades of yellow or brown.

The Cg horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 2 to 0. The texture is sand or loamy sand. Carbonatic accumulations are common in some pedons. Shell fragments range from few to common.

Delray series

The Delray series consists of very poorly drained soils that formed in marine sandy and loamy material. Permeability is moderate or moderately rapid. The soils are nearly level and are in low shallow depressions. In most years, if the soils are not drained, the water table is at or slightly above the surface for more than 6 months of the year. Slopes are less than 2 percent. These soils are loamy, mixed, hyperthermic Grossarenic Argiaquolls.

Delray soils are near Bradenton, Felda, Floridana, EauGallie, Manatee, Myakka, Ona, Pomona, and Waveland soils. Bradenton soils do not have a mollic epipedon but have an argillic horizon at a depth of less than 20 inches. Felda soils do not have a mollic epipedon but have an argillic horizon at a depth between 20 and 40 inches. Floridana soils have an argillic horizon at a depth between 20 and 40 inches. Manatee soils have an argillic horizon at a depth of less than 20 inches. EauGallie, Myakka, Ona, Pomona, and Waveland soils have a spodic horizon and are better drained than Delray soils.

Typical pedon of Delray mucky loamy fine sand, in a wooded area, about 2.5 miles east of the Sarasota County line and 0.75 mile south of Florida Highway 18, NW1/4NE1/4 sec. 16, T. 37 S., R. 21 E.

A11—0 to 8 inches; black (N 2/0) mucky loamy fine sand; weak medium granular structure; very friable; common fine and medium roots; neutral; gradual smooth boundary.

A12—8 to 16 inches; black (10YR 2/1) loamy fine sand; few fine faint dark gray mottles; weak medium granular structure; very friable; many fine roots; neutral; clear wavy boundary.

A21—16 to 21 inches; grayish brown (10YR 5/2) fine sand; common medium distinct very dark gray (10YR 3/1) streaks and mottles; single grained; loose; common fine and few medium roots; neutral; clear wavy boundary.

A22—21 to 43 inches; light brownish gray (10YR 6/2) fine sand; common medium distinct dark gray (10YR 4/1) mottles and very dark gray (10YR 3/1) streaks along old root channels; single grained; loose; common fine and few medium roots; neutral; clear wavy boundary.

A23—43 to 48 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine roots; neutral; clear wavy boundary.

B21tg—48 to 51 inches; grayish brown (2.5Y 5/2) fine sandy loam; weak medium subangular blocky structure; friable; sand grains coated and bridged with clay; few fine roots; mildly alkaline; clear wavy boundary.

B22tg—51 to 66 inches; grayish brown (2.5Y 5/2) sandy clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few clay films on ped surfaces; neutral; gradual wavy boundary.

B23tg—66 to 75 inches; greenish gray (5GY 6/1) sandy clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; clay films on ped surfaces; neutral; clear wavy boundary.

B24tg—75 to 80 inches; grayish brown (2.5Y 5/2) sandy clay loam; few fine faint light gray mottles; weak medium subangular blocky structure; firm; few clay films on ped surfaces; common fine sand lenses between peds; neutral.

Reaction ranges from medium acid to neutral in the A horizon and from neutral to mildly alkaline in the Btg horizon.

The A1 horizon has hue of 10YR, value of 3 or less, and chroma of 2 or 1; or it has no hue (N) and value of 2 or 3. The content of organic matter ranges from about 2 to 18 percent. The horizon ranges from 10 to 24 inches in thickness.

The A2 horizon has hue of 10YR or 2.5YR, value of 4 to 7, and chroma of 2; or it has hue of 10YR, value of 4 to 7, and chroma of 1; or it has no hue (N) and value of 4 to 7. The texture is fine sand or sand. The horizon ranges from 27 to 55 inches in thickness.

The B2tg horizon has hue of 10YR to 5GY, value of 4 to 6, and chroma of 1; or hue of 10YR, value of 4 to 6, and chroma of 2; or it has no hue (N), and value is 4 to 6. It has mottles of brown, yellow, or olive in some pedons. Its texture is fine sandy loam or sandy clay loam.

The B3g horizon is similar in color to the B2tg horizon. Its texture is loamy sand or loamy fine sand. There is no B3g horizon in some pedons.

Duette series

The Duette series consists of moderately well drained soils that formed in thick deposits of marine sand. Permeability is moderately rapid. The soils are nearly level to gently sloping and are on low ridges and knolls in flatwoods. In most years, if the soils are not drained, the water table is at a depth of 48 to 72 inches for 1 to 4 months during the wet season. It is at a depth of more than 72 inches for the rest of the year. Slopes range

from 0 to 5 percent. These soils are sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods.

Duette soils are near Cassia, Myakka, and Pomello soils. Cassia and Myakka soils have a spodic horizon at a depth of less than 30 inches. Cassia soils are somewhat poorly drained, and Myakka soils are poorly drained. Pomello soils have a spodic horizon at a depth between 30 and 50 inches.

Typical pedon of Duette fine sand, 0 to 5 percent slopes, in an area of sand scrub, approximately 2.25 miles east of the northeast corner of the Myakka River State Park, SW1/4SW1/4SW1/4 sec. 3, T. 37 S., R. 21 E.

A1—0 to 4 inches; very dark gray (10YR 3/1) rubbed, salt and pepper appearance unrubbed, fine sand; weak fine granular structure; friable; many fine and medium roots; strongly acid; clear smooth boundary.

A21—4 to 12 inches; light gray (10YR 7/2) fine sand; single grained; loose; few fine and coarse roots; slightly acid; clear smooth boundary.

A22—12 to 58 inches; white (10YR 8/1) fine sand; single grained; loose; few fine and coarse roots; slightly acid; clear smooth boundary.

B21h—58 to 64 inches; dark brown (7.5YR 3/2) fine sand; weak medium subangular blocky structure; friable; sand grains well coated with organic matter; few fine roots; strongly acid; clear wavy boundary.

B22h—64 to 80 inches; black (5YR 2/1) fine sand; weak medium subangular blocky structure; friable; many fine and medium roots; strongly acid.

Reaction ranges from slightly acid to strongly acid throughout. Texture is sand or fine sand in all horizons.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Unrubbed material has a salt and pepper appearance. Thickness ranges from 2 to 6 inches.

The A2 horizon has hue of 10YR, value of 6 to 8, and chroma of 1 or 2. Combined thickness of the A1 and A2 horizons ranges from 51 to 75 inches.

The Bh horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 2 or 3, and chroma of 1 to 4.

EauGallie series

The EauGallie series consists of poorly drained soils that formed in thick beds of sandy and loamy marine sediment. Permeability is moderate to moderately rapid. The soils are nearly level and are in broad areas of flatwoods and, in some places, in slightly depressed areas. In most years, a water table is at a depth of less than 10 inches for 2 to 4 months in wet seasons and at a depth of less than 40 inches for more than 6 months of the year. Slopes range from 0 to 2 percent. These soils are sandy, siliceous, hyperthermic Alfic Haplaquods.

EauGallie soils are near Delray, Pinellas, and Wabasso soils. Delray soils are very poorly drained, have a mollic epipedon, and do not have a spodic horizon. Pinellas soils do not have a spodic horizon. Wabasso soils have an argillic horizon at a lesser depth.

Typical pedon of EauGallie fine sand, in a pasture, about 2.5 miles west of Foxleigh and 3.25 miles southeast of the Manatee River, SW1/4NE1/4 sec. 26, T. 34 S., R. 18 E.

Ap—0 to 5 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine roots; mixture of light gray sand grains and black organic matter granules; very strongly acid; gradual wavy boundary.

A21—5 to 12 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine roots; very strongly acid; gradual wavy boundary.

A22—12 to 28 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine roots; few medium distinct grayish brown (10YR 5/2) mottles; very strongly acid; abrupt wavy boundary.

B2h—28 to 42 inches; black (5YR 2/1) fine sand; massive in place, crushes to moderate medium granular structure; friable sand grains coated with organic matter; few fine roots; very strongly acid; clear wavy boundary.

B2tg—42 to 50 inches; grayish brown (2.5Y 5/2) sandy clay loam; moderate medium subangular blocky structure; firm and slightly sticky; few fine roots; sand grains coated and bridged with clay; slightly acid; gradual wavy boundary.

C—50 to 65 inches; mixed lenses and pockets of grayish brown (10YR 5/2) fine sand, loamy fine sand, and fine sandy loam; massive; friable; few pockets of grayish brown (2.5Y 5/2) sandy clay loam; slightly acid.

The solum is more than 46 inches thick. The A horizon is less than 30 inches thick. The Btg horizon is at a depth of more than 40 inches. The A and Bh horizons are sand or fine sand.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1. It ranges from 3 to 9 inches in thickness. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 2 or 1. The A horizon is very strongly or strongly acid.

The B2h horizon has no hue (N) and value of 2; or hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; or hue of 5YR and 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 3, and chroma of 3. The sand grains are coated with organic matter. Reaction ranges from very strongly acid to slightly acid. The B3 horizon has hue of 10YR, value of 3 to 6, and chroma of 3. It consists of sand or fine sand. It is commonly below the Bh horizon. The A'2 horizon has hue of 10YR, value of 4 or 5, and chroma of 1; or hue of 10YR or 2.5Y, value of

5 or 6, and chroma of 2. There is no A'2 horizon in some pedons.

The B2tg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 1. In some pedons it has mottles in shades of brown, yellow, or gray. Its texture is sandy loam or sandy clay loam. There are pockets of sand or loamy sand. Reaction is medium acid to mildly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 1. In some pedons it has mottles in shades of yellow or brown. Its texture is fine sand, loamy fine sand, or sandy loam. The horizon has pockets of finer textured material in some pedons. Reaction is slightly acid to mildy alkaline.

Estero series

The Estero series consists of very poorly drained soils that formed in thick deposits of sandy marine sediment under conditions favorable for the accumulation of organic material. Permeability is moderately rapid. These soils are nearly level and are in tidal mangrove swamps. Slopes are less than 1 percent. These soils are flooded daily by high tides. The water table is above the surface or just below the surface, depending on the tide. These soils are sandy, siliceous, hyperthermic Typic Haplaquods.

Estero soils are near Wulfert and Kesson soils in tidal swamps and Myakka, Delray, Bradenton, and St. Johns soils on uplands. Wulfert soils are organic. Kesson soils do not have a spodic horizon. Myakka, Delray, Bradenton, and St. Johns soils do not have a histic epipedon. Delray soils have a mollic epipedon, do not have a spodic horizon, and have an argillic horizon. Bradenton soils do not have a spodic horizon but have an argillic horizon. St. Johns soils have an umbric epipedon.

Typical pedon of Estero muck, in a mangrove swamp, on Perico Island, SW1/4SE1/4 sec. 27, R. 16 E., T. 34 S.

Oa—0 to 6 inches; black (10YR 2/1) muck; about 90 percent fiber, less than 10 percent rubbed; massive; friable; neutral; abrupt smooth boundary.

A11—6 to 11 inches; black (N 2/0) fine sand; weak fine granular structure; very friable; many fine roots; moderately alkaline; clear smooth boundary.

A12—11 to 14 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine roots; moderately alkaline; clear wavy boundary.

A21—14 to 20 inches; light brownish gray (10YR 6/2) fine sand; few fine distinct yellowish red (5YR 5/8) mottles; single grained; loose; few fine roots; moderately alkaline; clear wavy boundary.

A22—20 to 31 inches; grayish brown (10YR 5/2) fine sand; few medium distinct yellowish red (5YR 5/6) mottles; single grained; loose; few very fine roots; mildly alkaline; abrupt wavy boundary.

B21h—31 to 41 inches; black (5YR 2/1) and dark grayish brown (10YR 4/2) fine sand; massive; very friable; sand grains thinly coated with organic matter; very strongly acid; clear wavy boundary.

B22h—41 to 46 inches; black (10YR 2/1) and dark reddish brown (5YR 3/2) fine sand; massive; very friable; sand grains thinly coated with organic matter; very strongly acid; gradual wavy boundary.

B3—46 to 56 inches; dark brown (10YR 4/3) and black (10YR 2/1) fine sand; massive; very friable; very strongly acid; clear wavy boundary.

C—56 to 80 inches; grayish brown (10YR 5/2) fine sand; few fine distinct black (10YR 2/1) mottles; single grained; loose; very strongly acid.

Reaction in the Oa and A horizons ranges from neutral to moderately alkaline by field test and from very strongly acid to mildly alkaline after drying. The Bh horizon is strongly acid or very strongly acid. Conductivity of the saturation extract ranges from about 245 to 350 mmho/cm in the Oa horizon and from 15 to 45 mmho/cm in the mineral horizons.

The Oa or Oe horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. In pedons where the Oa or Oe horizon is less than 10 inches thick, there is a histic epipedon if the soil is mixed to a depth of 10 inches.

The A1 horizon has hue of 10YR, value of 2, and chroma of 1; or value of 3 or 4 and chroma of 1 or 2; or hue of 2.5Y, value of 3 or 4, and chroma of 2; or it has no hue (N), and value is 2 to 4. Where value is 3 or less and chroma is 2 or 1, it is less than 10 inches thick even after mixing with the Oa or Oe horizon to a depth of 10 inches. The texture is sand, fine sand, mucky sand, or mucky fine sand.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2 and, in some pedons, has brown, yellow, red, or gray mottles and streaks. Its texture is sand or fine sand.

The Bh horizon has hue of 10YR, value of 2, and chroma of 1; or value of 3 and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 2, and chroma 1 or 2; or value of 3 and chroma of 1 to 4. The B21h horizon does not have colors of higher chroma, as described, in all pedons. Texture is sand, fine sand, or loamy fine sand. There are few to common uncoated sand grains in the upper part of the horizon.

The B3 horizon has hue of 10YR, value of 3, and chroma of 3; or value of 4 and chroma of 2 to 4; or hue of 7.5YR and 5YR, value of 4, and chroma of 2 or 4. Its texture is sand or fine sand.

The C horizon has hue of 10YR, value of 4 to 7, and chroma of 3 or less. Its texture is sand or fine sand. In some pedons, shells are mixed with the sand.

Felda series

The Felda series consists of poorly drained soils that formed in sandy and loamy marine sediment underlain by calcareous material. Permeability is moderate to moderately rapid. These soils are nearly level and are in low hammocks, sloughs, and drainageways. Slopes are generally smooth and are less than 2 percent. In most years, if the soils are not drained, the water table is at a depth of less than 10 inches for 2 to 4 months of the year and at a depth of 10 to 40 inches for about 6 months of the year. It recedes to a depth of more than 40 inches in dry seasons. Drainageways are frequently flooded by stream overflow. These soils are loamy, siliceous, hyperthermic Arenic Ochraqualfs.

Felda soils are near Bradenton, Delray, EauGallie, Floridana, Manatee, Wabasso, and Waveland soils. Bradenton soils have an A horizon less than 20 inches thick. Delray, Floridana, and Manatee soils have a mollic epipedon. Delray soils have an A horizon more than 40 inches thick. Manatee soils have an A horizon less than 20 inches thick. EauGallie, Wabasso, and Waveland soils have a spodic horizon.

Typical pedon of Felda fine sand, in an improved pasture, about 1.5 miles northeast of Parrish, SE1/4NE1/4 sec. 21, T. 33 S., R. 19 E.

A1—0 to 3 inches; very dark gray (10YR 3/1) rubbed, fine sand; weak fine granular structure; very friable; many fine roots; strongly acid; clear wavy boundary.

A21—3 to 11 inches; grayish brown (10YR 5/2) fine sand; many fine faint very dark gray, dark gray, and brown streaks and mottles; single grained; loose; many fine roots; slightly acid; gradual wavy boundary.

A22—11 to 24 inches; grayish brown (10YR 5/2) fine sand; many medium distinct dark yellowish brown (10YR 4/6) mottles; single grained; loose; common fine roots; slightly acid; clear wavy boundary.

B21tg—24 to 27 inches; grayish brown (10YR 5/2) fine sandy loam; many medium distinct dark yellowish brown (10YR 4/6) mottles; weak coarse subangular blocky structure; very friable; neutral; few krotovinas filled with grayish brown fine sand; gradual wavy boundary.

B22tg—27 to 33 inches; gray (10YR 5/1) sandy clay loam; many medium distinct dark yellowish brown (10YR 4/6) mottles; weak coarse subangular blocky structure; friable; clay bridging between sand grains; few krotovinas filled with grayish brown fine sand; mildly alkaline; gradual wavy boundary.

B23tg—33 to 64 inches; light gray (10YR 6/1) sandy clay loam; many coarse prominent brownish yellow (10YR 6/8) mottles; weak coarse subangular blocky structure; friable; clay bridging between sand grains; few krotovinas filled with grayish brown fine sand; mildly alkaline; gradual wavy boundary.

B3g—64 to 80 inches; light gray (10YR 6/1) sandy loam; few medium distinct brownish yellow (10YR 6/8) mottles; massive; very friable; mildly alkaline.

The solum ranges from about 30 to 80 inches or more in thickness.

The A1 or Ap horizon has hue of 10YR, value of 2 to 5, and chroma of 1; or hue of 10YR or 2.5Y, value of 5, and chroma of 2; or it has no hue (N), and value is 2 to 4. Reaction ranges from strongly acid to slightly acid. Thickness ranges from 3 to 8 inches.

The A2 horizon has hue of 10YR, value of 4, and chroma of 1; or value of 5 to 7 and chroma of 1 or 2; or hue of 2.5Y, value of 5 or 6, and chroma of 2; or it has no hue (N), and value is 4 to 7. Yellow and brown mottles range from few to many. Reaction ranges from slightly acid to mildly alkaline. Thickness of the A horizon ranges from 20 to 40 inches.

The B2tg horizon has hue of 10YR or 5Y, value of 4 or 5, and chroma of 1; or value of 6 or 7 and chroma of 1 or 2; or hue of 2.5Y, value of 4 to 7, and chroma of 2; or it has no hue (N), and value is 4 to 7. Mottles of yellow, brown, or red range from few to many. Reaction ranges from neutral to moderately alkaline. Texture ranges from sandy loam to sandy clay loam. Krotovinas filled with sandy material from the A2 horizon range from none to common.

The B3g horizon has the same color range and reaction range as the B2tg horizon. Its texture ranges from loamy sand to fine sandy loam.

The C3 horizon has a color range like that of the B2tg horizon. Its texture ranges from sand to loamy fine sand. There is not a C3 horizon in some pedons.

Floridana series

The Floridana series consists of very poorly drained, slowly permeable soils that formed in sandy and loamy marine sediment. The soils are nearly level and are in depressions and in low broad flats. In most years, if the soils are not drained, the water table in the low broad flats is within 10 inches of the surface for more than 6 months of the year. In most years, the depressions are ponded for 6 to 9 months of the year. Slopes are less than 2 percent. These soils are loamy, siliceous, hyperthermic Arenic Argiaquolls.

Floridana soils are near Bradenton, Chobee, Delray, EauGallie, Felda, Immokalee, Manatee, Okeelanta, and Tomoka soils. Bradenton soils are poorly drained, have an A horizon less than 20 inches thick, and do not have a mollic epipedon. Chobee and Manatee soils have an A

horizon less than 20 inches thick. Felda soils are poorly drained and do not have a mollic epipedon. Delray soils have an argillic horizon between depths of 40 and 80 inches. EauGallie and Immokalee soils are poorly drained, do not have a mollic epipedon, but have a Bh horizon. Okeelanta and Tomoka soils are organic.

Typical pedon of Floridana fine sand, in a pasture, about three-fourths of a mile east of the intersection of Buckeye Road and U.S. Highway 31, NE1/4NE1/4 sec. 10, T. 33 S., R. 19 E.

A11—0 to 4 inches; black (N 2/0) fine sand; weak fine granular structure; friable; many fine and few medium roots; sand grains coated with organic material; medium acid; clear wavy boundary.

A12—4 to 15 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine and few medium roots; many fine and few coarse gray (10YR 5/1) mottles; slightly acid; clear wavy boundary.

A2—15 to 32 inches; gray (10YR 6/1) fine sand; common coarse distinct very dark gray (10YR 3/1) mottles; single grained; loose; common medium roots; slightly acid; clear wavy boundary.

B2tg—32 to 44 inches; dark gray (10YR 4/1) sandy clay loam; common coarse faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; slightly plastic; common fine and medium roots; sand grains coated and bridged with clay; mildly alkaline; gradual wavy boundary.

B3g—44 to 65 inches; gray (N 6/0) sandy loam; common medium faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; common medium lenses and pockets of light gray (10YR 7/1) loamy fine sand and fine sand; many uncoated sand grains; mildly alkaline; gradual wavy boundary.

Cg—65 to 80 inches; light gray (10YR 7/1) fine sand; single grained; loose; common medium pockets of sandy loam; mildly alkaline.

In all horizons, reaction ranges from medium acid to mildly alkaline.

The A1 horizon has hue of 10YR or 2.5Y, or it has no hue (N); value is 3 or less and chroma is 2 to 0. It is 10 to 16 inches thick. The A11 horizon is fine sand, and the A12 horizon is sand or fine sand. The A2 horizon has hue of 10YR or 2.5Y, or it has no hue (N); value is 4 to 7, and chroma is 2 to 0. It is fine sand or sand. The combined thickness of the A1 and A2 horizons ranges from 20 to 40 inches.

The B2tg and B3g horizons have hue of 10YR or 2.5Y, or they have no hue (N); value is 5 to 7, and chroma is 2 to 0. In some pedons they have mottles of gray, yellow, or brown. They are sandy loam or sandy clay loam. In some pedons there are pockets of sand, fine sand, or loamy fine sand. The clay content ranges from 14 to 30 percent but is normally 16 to 23 percent.

The Cg horizon has hue of 10YR, value of 6 or 7, and chroma of 1 or 2. It is sand, fine sand, or loamy sand.

Gator series

The Gator series consists of very poorly drained, moderately permeable soils that formed in thin deposits of well decomposed organic material and underlying sandy and loamy mineral material. The soils are nearly level. They are in freshwater marshes. Slopes are less than 2 percent. In undrained areas the water table is at or above the surface except during extended dry periods. These soils are loamy, siliceous, euic, hyperthermic Terric Medisaprists.

Gator soils are near Felda, Manatee, and Parkwood Variant soils. All the associated soils are mineral soils and, except for Manatee soils, are better drained and are on higher landscapes than Gator soils.

Typical pedon of Gator muck, about 3 miles north of Parish and 0.25 mile east of U.S. Highway 301, SW1/4NW1/4 sec. 10, T. 33 S., R. 19 E.

Oa—0 to 18 inches; black (10YR 2/1) muck; moderate medium granular structure; friable; many fine roots; slightly acid; clear wavy boundary.

IIC1—18 to 25 inches; light gray (10YR 7/2) sandy loam; massive; friable; slightly acid; clear wavy boundary.

IIC2—25 to 42 inches; dark grayish brown (10YR 4/2) sandy loam; massive; friable; slightly acid; gradual wavy boundary.

IIC3—42 to 55 inches; grayish brown (10YR 5/2) sandy loam; massive; friable; slightly acid; gradual wavy boundary.

IIIC4—55 to 72 inches; grayish brown (10YR 5/2) loamy sand; massive; friable; slightly acid; gradual wavy boundary.

IIIC5—72 to 80 inches; stratified light gray (10YR 6/1) sand and loamy sand; single grained; loose; slightly acid.

Reaction in the Oa horizon is more than 4.5 in 0.01*M* $CaCl_2$ and more than 6.1 in field test. The IIC and IIIC horizons range from slightly acid to moderately alkaline.

The Oa horizon ranges from 16 to 40 inches in thickness. It has no hue (N) or has hue of 10YR or 5YR; value is 2, and chroma is 0 or 1; or hue of 5YR, value of 2, and chroma of 2; or value of 3 and chroma of 1 or 2.

The IIC horizon has hue of 10YR, value of 2 to 7, and chroma of 1 or 2. It has mottles that have higher or lower value and chroma in some pedons. Its texture is sandy loam, fine sandy loam, or sandy clay loam.

The IIIC horizon has the same color range as the IIC horizon and also has hue of 2.5YR. Its texture is variable, ranging from sand to loamy fine sand. It is commonly stratified.

Hallandale series

The Hallandale series consists of poorly drained, rapidly permeable, shallow soils that formed in thin beds of sandy marine sediment over large limestone boulders. The soils are nearly level. They are in low areas generally bordering ponds and swamps. In most years, if the soils are not drained, the water table is within 10 inches of the surface for 4 to 6 months of the year and at a depth of 10 to 30 inches for the rest of the time, except during extremely dry periods. These soils are siliceous, hyperthermic Typic Psammaquents.

Hallandale soils are near Broward Variant, Chobee, Palmetto, Parkwood Variant, and Wabasso soils. Broward Variant and Wabasso soils have a spodic horizon. Broward Variant soils have limestone at a depth between 20 and 40 inches. Wabasso soils do not have limestone but have an argillic horizon. Chobee soils have a mollic epipedon, an argillic horizon, and do not have limestone. Parkwood Variant soils have a calcareous argillic horizon. Palmetto soils have a deep argillic horizon and do not have limestone.

Typical pedon of Hallandale fine sand, in a wooded area, about 2.5 miles west of Oneco, SW1/4SE1/4 sec. 10, T. 35 S., R. 17 E.

A—0 to 6 inches; dark gray (10YR 4/1) sand; few medium faint dark grayish brown (10YR 4/2) mottles; weak fine granular structure; very friable; many uncoated sand grains; many fine and medium, few coarse roots; strongly acid; abrupt wavy boundary.

C—6 to 15 inches; very pale brown (10YR 7/3) sand; common medium distinct light yellowish brown (10YR 6/4) and few fine distinct yellowish brown (10YR 5/8) mottles; single grained; loose; few fine and medium roots; medium acid; abrupt wavy boundary.

IIR—15 inches; hard fractured limestone boulders.

This soil is commonly 7 to 20 inches thick, but there is a thin discontinuous Bt horizon in fractures between limestone boulders and in solution holes. The solution holes extend to a depth of 50 inches or more.

The A horizon ranges from strongly acid to slightly acid. It has no hue (N) or has hue of 10YR; value is 2 to 5, and chroma is 1 or 0. It ranges from 2 to 7 inches in thickness.

The C horizon has hue of 10YR, value of 4 to 7, and chroma of 1 to 4. Its texture is sand or fine sand. Reaction is medium acid to moderately alkaline.

The underlying limestone appears to be a highly fractured remnant of bedrock that once was continuous. It consists mostly of large flat boulders. The fractures between the boulders range from less than 1 inch to 3 inches or more in width. Solution holes are in and between the boulders and range from about 4 inches to 3 feet in diameter and are 1 to 6 feet apart.

The Bt horizon is sandy loam, fine sandy loam, or sandy clay loam. It is thin and discontinuous and is in solution pits. It has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. There is no Bt horizon in some pedons. In the deeper solution pits the Bt horizon is thicker and has a higher content of clay.

Immokalee series

The Immokalee series consists of poorly drained soils that formed in thick beds of sandy marine sediment. Permeability is moderate to moderately rapid. These soils are nearly level. They are in small to large nearly level depressions. In most years, they are ponded for 6 to 9 months. Slopes are less than 2 percent. These soils are sandy, siliceous, hyperthermic Arenic Haplaquods.

Immokalee soils are near Delray, Floridana, Myakka, Okeelanta, Palmetto, and Pomona soils. Delray, Floridana, and Okeelanta soils are very poorly drained. Delray and Floridana soils have a mollic epipedon and an argillic horizon and do not have a spodic horizon. Okeelanta soils are organic. Myakka soils have an A horizon less than 30 inches thick. Palmetto and Pomona soils have an argillic horizon. Palmetto soils do not have a spodic horizon.

Typical pedon of Immokalee fine sand, in an area of Floridana-Immokalee-Okeelanta association, in a depression, about 0.4 mile northwest of the northeast corner of the Myakka River State Park, NW1/4SW1/4 sec. 24, T. 37 S., R. 21 E.

A11—0 to 5 inches; black (10YR 2/1) sand; weak fine granular structure; loose; many fine and common medium roots; very strongly acid; gradual smooth boundary.

A12—5 to 10 inches; dark gray (10YR 4/1) fine sand; common medium gray (10YR 5/1) mottles; single grained; loose; many fine and common medium roots; very strongly acid; gradual smooth boundary.

A21—10 to 16 inches; gray (10YR 5/1) fine sand; single grained; loose; many fine and few medium roots; very strongly acid; gradual smooth boundary.

A22—16 to 34 inches; light gray (10YR 6/1) fine sand; single grained; loose; few fine and medium roots; common medium distinct very dark gray (10YR 3/1) vertical streaks along root channels; very strongly acid; abrupt wavy boundary.

B21h—34 to 39 inches; dark reddish brown (5YR 3/3) fine sand; common coarse distinct dark brown (10YR 3/3) mottles; weak coarse subangular blocky structure; firm; noncemented; many fine roots; common medium distinct dark grayish brown (10YR 4/2) streaks; sand grains coated with colloidal organic matter, many uncoated; very strongly acid; clear broken boundary.

B22h—39 to 43 inches; dark brown (7.5YR 3/2) fine coarse subangular blocky structure; firm; noncemented; common fine roots; sand grains coated with colloidal organic matter; very strongly acid; clear irregular boundary.

C—43 to 80 inches; grayish brown (10YR 5/2) fine sand; common medium and fine gray (10YR 6/1) to light gray (10YR 7/1) mottles; single grained; loose; few fine roots; common medium distinct very dark gray (10YR 3/1) streaks increasing to many with increasing depth; very strongly acid.

The soil is sand or fine sand in all horizons except the A1 horizon to a depth of 80 inches or more; the A1 horizon is fine sand. Reaction ranges from strongly acid to very strongly acid except where the soil has been limed or irrigated with alkaline water.

The A1 horizon is light gray and black sand that has a salt and pepper appearance. When crushed, it has hue of 10YR or 2.5Y, value of 2, and chroma of 1 or 0; or value of 3 or 4 and chroma of 2 or 1. It ranges from 2 to 10 inches in thickness.

The A2 horizon has hue of 10YR or 2.5Y, value of 5 or more, and chroma of 2 or 1. In many pedons, vertical streaks of material from the A1 horizon extend into the A2 horizon. In many pedons there is a transitional A2&Bh horizon one-half inch to 2 inches thick. Total thickness of the A horizon is 30 to 50 inches.

The Bh horizon is not cemented. Sand grains are mostly coated with colloidal organic matter. The horizon has hue of 5YR, 7.5YR, or 10YR, value of 2, and chroma of 2 or 1; or hue of 5YR or 7.5YR, value of 3, and chroma of 2 to 4. In many pedons it has dark brown to black mottles and lighter colored streaks. It ranges from 4 to 24 inches in thickness.

The B3 horizon has hue of 7.5YR, value of 4, and chroma of 2 to 4; or hue of 10YR, value of 3, and chroma of 4; or value of 4 and chroma of 3 or 4. In some pedons there are fragments that are not cemented or mottles that have the same color as those of the Bh horizon. There is no B3 horizon in some pedons.

The C horizon has hue of 10YR, value of 4 to 7, and chroma of 3 or less. In some pedons it has mottles in shades of brown, yellow, or gray.

Kesson series

The Kesson series consists of very poorly drained soils that formed in thick deposits of sand and shell fragments. Permeability is moderately rapid to rapid. The soils are nearly level. They are in tidal mangrove swamps. Slopes are less than 1 percent. They are flooded daily by high tides. These soils are siliceous, hyperthermic Typic Psammaquents.

Kesson soils are near Wulfert, Estero, and Canaveral soils in tidal swamps and Myakka and Bradenton soils on uplands. Wulfert soils are organic. Estero soils have a spodic horizon. Canaveral soils are somewhat poorly drained and are on higher elevations. Myakka and Bradenton soils are better drained than Kesson soils. Myakka soils have a spodic horizon. Bradenton soils have an argillic horizon, and they do not have appreciable amounts of sulfur.

Typical pedon of Kesson fine sand, in an area of Wulfert-Kesson association, in a mangrove swamp, on McGill Island, near the southwest corner of sec. 5, T. 34 S., R. 17 E.

A—0 to 6 inches; black (10YR 2/1) fine sand; single grained; loose; common fine and medium roots; about 15 percent shell fragments; about 3 percent sulfur; moderately alkaline; calcareous; clear smooth boundary.

C1—6 to 14 inches; pale brown (10YR 6/3) fine sand; single grained; loose; common fine and medium roots; about 10 percent shell fragments; about 3 percent sulfur; moderately alkaline; calcareous; clear smooth boundary.

C2—14 to 25 inches; light gray (5Y 7/1) and gray (5Y 6/1) fine sand; common medium distinct dark gray (10YR 4/1) streaks; single grained; loose; about 5 percent shell fragments; about 2.5 percent sulfur; moderately alkaline; calcareous; gradual wavy boundary.

C3—25 to 45 inches; light gray (5Y 7/1) fine sand; single grained; loose; about 30 percent shell fragments; moderately alkaline; calcareous; gradual wavy boundary.

C4—45 to 80 inches; white (5Y 8/1) fine sand; single grained; loose; about 5 percent shell fragments; moderately alkaline; calcareous.

The content of sulfur is more than 0.75 percent, and the $CaCO_3$ equivalent is more than three times the content of sulfur. Reaction ranges from mildly alkaline to strongly alkaline and calcareous. Texture is sand or fine sand throughout.

The A horizon has hue of 10YR, value of 3 to 6, and chroma of 1 to 3. The content of shell fragments ranges from about 5 to 15 percent. In some pedons there is an organic horizon less than 8 inches thick above the A horizon.

The C horizon has hue of 10YR or 5Y, value of 5 to 7, and chroma of 1 to 3. The content of shell fragments ranges from about 5 to 30 percent.

Manatee series

The Manatee series consists of very poorly drained, moderately permeable soils that formed in thick beds of moderately fine textured material. The soils are nearly level. They are in depressions that once were overgrown with sawgrass but subsequently have been drained by large ditches and canals. In most years, the water table is within 10 inches of the surface for 2 to 4 months.

Slopes are less than 2 percent. These soils are coarse-loamy, siliceous, hyperthermic Typic Argiaquolls.

Manatee soils are near Bradenton, Chobee Variant, Felda, Floridana, and Parkwood Variant soils. Bradenton and Parkwood Variant soils do not have a mollic epipedon. Chobee Variant soils do not have an argillic horizon and are finer textured throughout. Felda soils do not have a mollic epipedon but have an argillic horizon at a depth of more than 20 inches. Floridana soils have an argillic horizon at a depth between 20 and 40 inches.

Typical pedon of Manatee mucky loamy fine sand, in a cultivated area, about 1.6 miles northeast of Parish, NE1/4NE1/4 sec. 21, T. 33 S., R. 19 E.

Ap—0 to 8 inches; black (10YR 2/1) mucky loamy fine sand; moderate medium granular structure; friable; many fine roots; slightly acid; clear wavy boundary.

A12—8 to 13 inches; black (10YR 2/1) loamy fine sand; moderate medium granular structure; friable; many fine roots; slightly acid; clear wavy boundary.

B21t—13 to 25 inches; very dark gray (10YR 3/1) fine sandy loam; weak fine subangular blocky structure; friable; sand grains are bridged and coated with clay; mildly alkaline; gradual wavy boundary.

B22tg—25 to 34 inches; dark gray (5YR 4/1) fine sandy loam; weak medium subangular blocky structure; slightly sticky; sand grains are bridged and coated with clay; mildly alkaline; gradual wavy boundary.

B3g—34 to 52 inches; dark gray (10YR 4/1) loamy fine sand; common coarse faint grayish brown fine sandy loam pockets; common medium prominent yellowish red (5YR 5/6) mottles in the lower part; weak fine subangular blocky structure; slightly sticky; mildly alkaline; gradual wavy boundary.

Cg—52 to 80 inches; dark gray (10YR 4/1) fine sand; few fine prominent yellowish red (5YR 5/6) mottles; many medium faint gray sand pockets; weak medium granular structure; friable; moderately alkaline.

The solum is 30 to 60 inches thick. Reaction ranges from slightly acid to mildly alkaline in the A horizon, neutral to mildly alkaline in the B2tg horizon, and mildly alkaline to moderately alkaline in the B3g and Cg horizons.

The Ap, or A1, horizon has no hue (N) and value of 2; or it has hue of 10YR, value of 2 or 3, and chroma of 1. It is 10 to 18 inches thick.

The B2t horizon has hue of 10YR, value of 2 to 4, and chroma of 1; or it has no hue (N) and value of 2. It is 21 to 60 inches thick. It is sandy loam or fine sandy loam. This horizon has pockets of fine sand or sandy loam. The B3 horizon has hue of 10YR, value of 4, and chroma of 1 or 2. It is as much as 18 inches thick. In many pedons, accumulations of soft calcium carbonate or nodules of calcium carbonate are common. The B3 horizon is loamy fine sand or loamy sand. There is no B3 horizon in some pedons.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1. It extends to a depth of 80 inches or more. In many pedons there are common accumulations of soft calcium carbonate or nodules of calcium carbonate. The horizon is loamy sand or fine sand.

Myakka series

The Myakka series consists of poorly drained and very poorly drained soils that formed in sandy marine deposits that are underlain in places by shells and shell fragments. Permeability is moderate to moderately rapid. The soils are nearly level. They are mainly in flatwoods on the mainland, but some are in high tidal marshes and some are on coastal islands of Anna Maria Key and Longboat Key. Slopes range from 0 to 5 percent. In most years, if the soils are not drained, the water table is within a depth of 10 inches for about 1 to 4 months of the year; it recedes to a depth of 40 inches or more in dry seasons. The high tidal marshes are flooded during storms or other periods when tides are above normal. These soils are sandy, siliceous, hyperthermic Aeric Haplaquods.

Myakka soils are near Cassia, EauGallie, Immokalee, Ona, Pomello, Wabasso, and Waveland soils on the mainland and Canaveral and Estero soils on the coastal islands. Cassia and Pomello soils are better drained than the Myakka soils. Pomello soils have a spodic horizon at a greater depth. EauGallie and Wabasso soils have an argillic horizon below the spodic horizon. Ona soils do not have an A2 horizon. Immokalee soils have a spodic horizon at a greater depth. Waveland soils have ortstein. Canaveral soils are better drained and do not have a spodic horizon. Estero soils are in mangrove swamps and have a histic epipedon.

Typical pedon of Myakka fine sand, 0 to 2 percent slopes, in an area of flatwoods, about 0.25 mile east of the Sarasota County line in the Myakka River State Park, SW1/4NW1/4 sec. 18, T. 37 S., R. 21 E.

A1—0 to 5 inches; dark gray (10YR 4/1) fine sand; weak fine granular structure; very friable; many fine and few medium roots; strongly acid; clear smooth boundary.

A21—5 to 13 inches; gray (10YR 6/1) fine sand; common fine and medium distinct dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) verticle streaks in root channels; single grained; loose; common fine and medium roots; very strongly acid; gradual wavy boundary.

A22—13 to 23 inches; light gray (10YR 7/1) fine sand; few fine and medium distinct dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) verticle streaks in root channels; single grained; loose; few fine roots; very strongly acid; abrupt wavy boundary.

B21h—23 to 29 inches; black (10YR 2/1) fine sand; weak coarse subangular blocky structure parting to moderate medium granular; friable; many fine and medium roots; few uncoated sand grains; very strongly acid; gradual wavy boundary.

B22h—29 to 37 inches; dark reddish brown (5YR 3/2) fine sand; weak coarse subangular blocky structure parting to moderate medium granular; friable; common fine roots; sand grains well coated with colloidal organic matter; very strongly acid; clear wavy boundary.

B3&Bh—37 to 45 inches; dark brown (10YR 4/3) fine sand; single grained; loose; many medium distinct dark reddish brown (5YR 3/2) fragments; strongly acid; clear wavy boundary.

A'2—45 to 61 inches; brown (10YR 5/3) fine sand; single grained; loose; strongly acid; clear wavy boundary.

B'23h—61 to 75 inches; very dark brown (10YR 2/2) fine sand; weak medium granular structure; friable; sand grains well coated with colloidal organic matter; strongly acid.

The solum is more than 40 inches thick. Reaction ranges from extremely acid to slightly acid, but in tidal marshes it ranges to moderately alkaline.

The A1, or Ap, horizon has hue of 10YR, value of 2 to 4, and chroma of 1; or it has no hue (N) and value of 2 to 4. It ranges from 4 to 8 inches in thickness. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 1; or it has no hue (N) and value of 6 to 8 and, in some pedons, mottles or streaks of gray, yellow, or brown. Total thickness of the A horizon ranges from 20 to 30 inches.

The Bh horizon has hue of 10YR, value of 2, and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 2 to 4. It is fine sand or loamy fine sand.

The B3 part of the B3&Bh horizon has hue of 7.5YR, value of 4, and chroma of 4; or hue of 10YR, value of 3 or 4, and chroma of 3 or 4 and medium and coarse fragments that have colors similar to those of the B2h horizon. Some pedons have a B3 horizon that has colors similar to those of the B3 part of the B3&Bh horizon.

The A'2 horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. There is no A'2 horizon in some pedons. The B2h horizon extends to a depth of 75 inches or more. The B'2h horizon has the same colors as those of the B2h horizon.

The C horizon has hue of 10YR, value of 4 to 7, and chroma of 2 or 1 and, in some pedons, has mottles of brown, yellow, or gray. On the coastal islands the B2h horizon is underlain by a IIC horizon that consists of variable amounts of shells, shell fragments, and sand. There is no C horizon in some pedons.

Okeelanta series

The Okeelanta series consists of very poorly drained, rapidly permeable soils that formed in well decomposed nonwoody plant remains and underlying sandy material. The soils are nearly level. They are in freshwater swamps, marshy depressions, and tidal marshes. Slopes are less than 2 percent. In most years, the soils are ponded or the water table is at or near the surface for 9 months or more. Tidal marshes are flooded daily. These soils are sandy or sandy-skeletal, siliceous, euic, hyperthermic Terric Medisaprists.

Okeelanta soils are near Anclote, Chobee, Floridana, Canova, and Manatee soils in swamps and EauGallie, Bradenton, Myakka, Wauchula, and Waveland soils in the surrounding flatwoods. All the associated soils are mineral soils. Chobee, Floridana, Canova, and Manatee soils have an argillic horizon. Anclote soils are sandy throughout. Bradenton soils are better drained than Okeelanta soils and have an argillic horizon. EauGallie, Myakka, Wauchula, and Waveland soils are better drained and have a spodic horizon.

Typical pedon of Okeelanta muck, tidal, about 0.3 mile southwest of the northeast corner of the county and about 200 yards northwest of the highway, NW1/4NE1/4 sec. 1, T. 33 S., R. 22 E.

Oa—0 to 20 inches; black (5YR 2/1) rubbed and unrubbed muck; about 5 percent fiber unrubbed; weak fine granular structure; very friable; many fine and common medium roots; neutral; clear smooth boundary.

IIC1—20 to 27 inches; black (10YR 2/1) sand; single grained; loose; few fine roots; mildly alkaline; clear wavy boundary.

IIC2—27 to 31 inches; grayish brown (10YR 5/2) sand with common, medium, distinct black (10YR 2/1) mottles; single grained; loose; mildly alkaline; gradual wavy boundary.

IIC3—31 to 60 inches; light brownish gray (10YR 6/2) sand with few medium distinct dark grayish brown (10YR 4/2) streaks; single grained; loose; mildly alkaline.

Reaction of the organic material ranges from medium acid to moderately alkaline by the Hellige-Troug test or is 4.5 or more in 0.01*M* CaCl2. The organic layers range from 16 to 40 inches in thickness.

The Oa horizon has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; or hue of 5YR, value of 3, chroma of 2 or 3; or hue of 10YR, value of 3 or 4, and chroma of 3; or it has no hue (N), and value is 2; or hue of 7.5YR, value of 3, and chroma of 2. The content of unrubbed fiber ranges to about 50 percent; the content of rubbed fiber ranges from 3 to 16 percent. The content of minerals ranges from about 10 to 40 percent.

The IIC horizon has hue of 10YR, value of 2 to 4, and chroma of 1; or value of 5 or 6 and chroma of 1 or 2; or

it has no hue (N), and value is 2 to 6. It ranges from sand to loamy fine sand. There are few to many shell fragments in some pedons.

Ona series

The Ona series consists of poorly drained, slowly permeable to very slowly permeable soils that formed in thick deposits of sandy marine sediment. The soils are nearly level. They are in flatwoods. Slopes are less than 2 percent. In most years, the water table is at a depth of 10 to 40 inches for 4 to 6 months of the year; it rises to a depth of less than 10 inches for 1 to 2 months of the year and recedes to a depth of more than 40 inches during very dry periods. These soils are sandy, siliceous, hyperthermic Typic Haplaquods.

Ona soils are near Adamsville Variant, Cassia, Delray, Myakka, Palmetto, St. Johns, and Waveland soils. Adamsville Variant and Cassia soils are better drained than Ona soils. Adamsville Variant soils do not have a spodic horizon. Cassia soils have an A2 horizon. Delray soils have a mollic epipedon and do not have a spodic horizon. Myakka, St. Johns, and Waveland soils have an A2 horizon. Palmetto soils do not have a spodic horizon but have an argillic horizon at a depth of more than 40 inches.

Typical pedon of Ona fine sand, ortstein substratum, in an improved pasture, about 2.9 miles southeast of the junction of Florida Highway 18 and the Sarasota County line, SE1/4NE1/4 sec. 9, T. 37 S., R. 21 E.

Ap—0 to 5 inches; black (10YR 2/1) rubbed, fine sand; weak fine granular structure; very friable; many fine roots; unrubbed material is a mixture of black organic matter and light gray sand grains; very strongly acid; clear smooth boundary.

B21h—5 to 11 inches; very dark brown (10YR 2/2) fine sand; moderate medium granular structure; friable, noncemented; common fine roots; sand grains well coated with colloidal organic matter; strongly acid; clear wavy boundary.

B22h—11 to 16 inches; dark reddish brown (5YR 2/2) fine sand; moderate medium granular structure; friable; noncemented; few fine roots; sand grains well coated with colloidal organic matter; strongly acid; clear wavy boundary.

A'21—16 to 37 inches; brown (10YR 5/3) fine sand; single grained; loose; many uncoated sand grains; strongly acid; gradual wavy boundary.

A'22—37 to 52 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; strongly acid; abrupt wavy boundary.

B'23h—52 to 68 inches; black (10YR 2/1) fine sand; massive; firm; weakly cemented; sand grains thickly coated with colloidal organic matter; strongly acid; gradual wavy boundary.

B'24h—68 to 80 inches; black (10YR 2/1) fine sand; massive; friable; sand grains well coated with colloidal organic matter; strongly acid.

Reaction ranges from medium acid to very strongly acid throughout, and the texture is sand or fine sand throughout. The B'h horizon is at a depth of 40 to 80 inches but more commonly it is at a depth of 40 to 60 inches.

The Ap, or A1, horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. In some pedons an incipient A2 horizon ranging to 2 inches in thickness is between the Ap or A1 horizon and the Bh horizon.

The Bh horizon has hue of 10YR, value of 2, and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 2 or 3. Sand grains are thinly to thickly coated with colloidal organic matter.

The A'2 horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3; or hue of 2.5Y, value of 5 or 6, and chroma of 2 and, in some pedons, mottles.

The B'23h horizon has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; or it has no hue (N), and value is 2. It is weakly or moderately cemented in more than half of the horizon. It is firm or very firm and is generally brittle. Sand grains are thickly coated with organic matter. In some pedons there is no B'24 horizon. The B'23h horizon extends to a depth of 80 inches or more or is underlain by a C horizon that has colors similar to those of the A'2 horizon. The B'24h horizon has color similar to that of the B'23h horizon; hue of 10YR, value of 2, and chroma of 2; or hue of 5YR, value of 3, and chroma of 2 or 3. This horizon is not cemented and has a loose to friable consistence.

Orlando series

The Orlando series consists of moderately well drained, rapidly permeable soils that formed in thick deposits of marine sand. The soils are nearly level. They are on uplands. The seasonal high water table is at a depth of 40 to 72 inches. Slopes range from 0 to 2 percent. These soils are sandy, siliceous, hyperthermic Quartzipsammentic Haplumbrepts.

Orlando soils are near Bradenton, Cassia, Ona, Myakka, Delray, and Tavares soils. Orlando soils have an umbric epipedon. Bradenton, Myakka, and Ona soils are poorly drained. Bradenton soils have an argillic horizon, and Myakka and Ona soils have a spodic horizon. Cassia soils are somewhat poorly drained and have a spodic horizon. Delray soils are very poorly drained and have a mollic epipedon.

Typical pedon of Orlando fine sand, moderately wet, 0 to 2 percent slopes, in an orange grove, in Parrish, NW1/4NE1/4 sec. 29, T. 3 S., R. 19 E.

Ap—0 to 12 inches; very dark gray (10YR 3/1) fine sand mixed with fine particles of decomposed organic matter; weak medium granular structure; very friable; many fine and medium roots; few uncoated sand grains; medium acid; clear wavy boundary.

C1—12 to 18 inches; dark brown (10YR 4/3) fine sand; single grained; loose; few fine roots; few fine carbon pieces; slightly acid; gradual wavy boundary.

C2—18 to 43 inches; brown (10YR 5/3) fine sand; single grained; loose; strongly acid; gradual wavy boundary.

C3—43 to 58 inches; pale brown (10YR 6/3) fine sand; few fine and medium strong brown (7.5YR 5/6) mottles; single grained; loose; strongly acid; gradual wavy boundary.

C4—58 to 80 inches; grayish brown (10YR 5/2) fine sand; common strong brown and yellowish brown mottles; single grained; loose; few vertical streaks of light gray (10YR 7/2) sand grains; strongly acid.

Reaction ranges from strongly acid to medium acid throughout except where lime has been applied. Fine sand extends to a depth of more than 80 inches. The content of silt and clay in the 10- to 40-inch control section is less than 10 percent.

The Ap or A1 horizon has hue of 10YR or 2.5Y, value of 3 or less, and chroma of 2 or 1.

The A&C horizon is generally a uniform mixture that has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 4 or less or value of 4 or 5 and chroma mainly of 2. There are other colors to a lesser extent. There are small pockets, lenses, or streaks of gray to white uncoated sand grains in some pedons. There is no A&C horizon in some pedons.

The C1, C2, and C3 horizons have hue of 10YR, value of 4, and chroma of 3 or 4, or value of 5 to 7 and chroma of 3 to 8. In some pedons fine to coarse mottles or splotches of gray to white uncoated sand are few to common in the C1, C2, and C3 horizons. They are not indicative of wetness. In most pedons the C3 horizon has a few distinct strong brown to brownish yellow mottles. The C4 horizon has hue of 10YR, value of 5 to 7, and chroma of 3 or less. It has few to common mottles in shades of yellow, brown, red, or gray.

Orsino series

The Orsino series consists of moderately well drained, very rapidly permeable soils that formed in thick beds of sandy marine deposits. The soils are nearly level to gently sloping. They are on low ridges and knolls at some of the higher elevations in the county. In most years, the water table is at a depth of 40 to 60 inches for more than 6 months of the year. It recedes to a depth of more than 60 inches during periods of low rainfall. Slopes range from 0 to 5 percent. These soils are hyperthermic, uncoated Spodic Quartzipsamments.

Orsino soils are near Cassia and Pomello soils. Cassia and Pomello soils have a spodic horizon.

Typical pedon of Orsino fine sand, in a forest of sand pine, 500 feet east of Warner Bayou and 0.25 mile south of the Manatee River, SE1/4SW1/4 sec. 20, T. 34 S., R. 17 E.

A1—0 to 4 inches; gray (10YR 5/1) fine sand; weak fine granular structure; very friable; common fine medium roots and few coarse roots; strongly acid; clear smooth boundary.

A2—4 to 18 inches; white (10YR 8/1) fine sand; few fine distinct brownish yellow (10YR 6/6) mottles; single grained; loose; few fine, medium, and coarse roots; strongly acid; abrupt irregular boundary.

B21&Bh—18 to 29 inches; brownish yellow (10YR 6/8) fine sand; weak medium granular structure; very friable; few medium roots; dark reddish brown (5YR 3/4) discontinuous uncemented bodies one-half inch to three-fourths of an inch in diameter along the exterior of white (10YR 8/1) tongues 10 inches long and 2 inches across; strongly acid; gradual smooth boundary.

B22—29 to 44 inches; brownish yellow (10YR 6/6) fine sand; common fine faint light yellowish brown and few medium faint reddish yellow (7.5YR 6/8) mottles; moderate medium granular structure; friable; few fine, medium, and coarse roots; strongly acid; clear smooth boundary.

B3—44 to 59 inches; yellow (10YR 7/6) fine sand; few coarse faint brownish yellow (10YR 6/6, 6/8) and many coarse distinct very pale brown (10YR 7/4) mottles; common coarse distinct dark gray (10YR 4/1) mottles in lower 3 inches; single grained; loose; few medium and coarse roots; strongly acid; clear wavy boundary.

C—59 to 80 inches; white (10YR 8/1) fine sand; few medium distinct red (2.5YR 5/8) mottles; single grained; loose medium acid.

Reaction is strongly acid or very strongly acid. Texture is sand or fine sand throughout except for the A1 horizon, which is fine sand.

The A1 horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. It ranges from 2 to 5 inches in thickness. The A2 horizon has hue of 10YR, value of 6 to 8, and chroma of 1 or 2. It is 9 to 26 inches thick. Total thickness of the A horizon is 22 to 28 inches.

The B horizon has hue of 10YR, value of 5 to 8, and chroma of 4 to 8. Tongues from the A2 horizon extending into the B horizon have hue of 10YR, value of 7 or 8, and chroma of 1 or 2. The Bh part of this horizon has discontinuous uncemented layers or coarse mottles that are one-half inch to 2 inches in diameter and have hue of 5YR, value of 3, and chroma of 3 or hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. The Bh part is generally at the upper contact of the B horizon

but in places extends throughout the horizon as small bodies of uncemented fine sand. The B&Bh horizon is 18 to 43 inches thick.

The C horizon has hue of 10YR, value of 6 to 8, and chroma of 1 to 4. It extends to a depth of 80 inches or more.

Palmetto series

The Palmetto series consists of deep, poorly drained soils that formed in thick deposits of sand and loamy marine sediment. Permeability is moderately slow. The soils are nearly level. They are in the flatwoods in sloughs, in poorly defined drainageways, and in depressions. Slopes are less than 2 percent. In most years, if the soils are not drained, the water table is at a depth of 10 inches for 2 to 6 months of the year. In depressions water is ponded for 2 to 6 months of the year. These soils are loamy, siliceous, hyperthermic Grossarenic Paleaquults.

Palmetto soils are near Delray, EauGallie, Wabasso, and Waveland soils. Delray soils have a mollic epipedon and are sandy to a depth of 80 inches or more. EauGallie, Wabasso, and Waveland soils have a spodic horizon. A part of the spodic horizon in Waveland soils is ortstein.

Typical pedon of Palmetto sand, about 2.25 miles north of Verna, SW1/4SW1/4 sec. 24, T. 35 S., R. 20 E.

A11—0 to 8 inches; black (10YR 2/1) sand; moderate medium granular structure; very friable; many fine roots; extremely acid; clear wavy boundary.

A12—8 to 10 inches; dark gray (10YR 4/1) sand; common medium distinct gray (10YR 5/1) mottles; single grained; loose; common fine roots; extremely acid; gradual wavy boundary.

A2—10 to 25 inches; gray (10YR 6/1) sand; common medium distinct gray (10YR 5/1) and light gray (10YR 7/1) mottles; single grained; loose; few fine roots; extremely acid; clear wavy boundary.

Bh&A2—25 to 30 inches; dark grayish brown (10YR 4/2) sand; many coarse distinct gray (10YR 5/1) mottles consisting of material from the A2 horizon and common medium distinct very dark grayish brown (10YR 3/2) Bh fragments; single grained; loose; many uncoated sand grains; extremely acid; gradual wavy boundary.

B21h—30 to 40 inches; dark grayish brown (10YR 4/2) sand; common medium faint very dark grayish brown (10YR 3/2) mottles; single grained; loose; many uncoated sand grains; extremely acid; gradual wavy boundary.

B22h—40 to 45 inches; very dark grayish brown (10YR 3/2) sand; common coarse faint dark grayish brown (10YR 4/2) mottles; single grained; loose; many uncoated sand grains; extremely acid; clear wavy boundary.

B21tg—45 to 60 inches; grayish brown (2.5Y 5/2) sandy clay loam; few medium distinct yellowish brown (10YR 5/6) and few coarse faint dark grayish brown mottles; weak coarse subangular blocky structure; friable; sand grains moderately coated and bridged with clay; very strongly acid; gradual wavy boundary.

B22tg—60 to 64 inches; dark grayish brown (2.5Y 4/2) sandy loam; common coarse faint grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky structure; friable; sand grains moderately coated and bridged with clay; very strongly acid; gradual wavy boundary.

B3g—64 to 68 inches; dark grayish brown (2.5Y 4/2) loamy sand; massive; friable; very strongly acid.

The B'2tg horizon is at a depth of more than 40 inches. The A and Bh horizons are extremely acid to strongly acid. The B2t, B3g, and Cg horizons are very strongly acid or strongly acid.

The A1, or Ap, horizon has hue of 10YR, value of 1 to 4, and chroma of 2 or 1; or it has no hue (N), and value is 1 to 4. It is as much as 8 inches thick where value is 2 or 3. Its texture is sand or fine sand.

The A2 horizon has no hue (N) or has hue of 10YR or 2.5Y; value is 5 to 7, chroma is 2 to 0, and there are mottles in some pedons; or value is 5, chroma is 2, and there are mottles. Its texture is sand or fine sand.

The Bh&A2 horizon has the same colors as those of the component horizons. There is no Bh&A2 horizon in some pedons.

The B2h horizon does not meet the requirements of a spodic horizon. It mainly has hue of 10YR, value of 3, and chroma of 2 or 3 or value of 4 and chroma of 2 to 4; or hue of 7.5YR, value of 4, and chroma of 2 or 4; but it ranges to hue of 10YR, value of 5, and chroma of 2 to 4 where the A2 horizon has value of 7. Uncoated sand grains in the B2h horizon are common to many. The horizon is sand or fine sand.

The A'2 horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 3 or less. Its texture is sand or fine sand. There is no A'2 horizon in some pedons.

The B2tg or B'2tg horizon has hue of 10YR or 5Y, value of 4 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 4 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 4 to 7, and chroma of 2; or it has no hue (N) and value of 4 to 7, and, in some pedons, mottles of yellow, brown, red, or gray. The control section is sandy loam or sandy clay loam. In some pedons the lower B2tg horizon is sandy clay.

The B3 or B'3g horizon has the same color range as that of the B2tg horizon. It ranges from loamy sand to fine sandy loam.

The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8, and chroma of 4 or less. It ranges from sand to loamy fine sand. There is no Cg horizon in some pedons.

Parkwood Variant

Parkwood Variant soils are poorly drained and moderately permeable. They formed in beds of sandy and loamy marine sediment overlying limestone. These soils are nearly level. They are in cabbage palm hammocks, in drainageways, or along the edge of ponds. Slopes are less than 2 percent. The water table is within a depth of 10 inches for 2 to 4 months in wet seasons. These soils are coarse-loamy, siliceous, hyperthermic Mollic Ochraqualfs.

Parkwood Variant soils are near Bradenton, Chobee, Delray, Felda, Manatee, and Wabasso soils. Bradenton and Chobee soils are fine-loamy. Chobee soils have a mollic epipedon. Delray soils have a mollic epipedon, and the argillic horizon is at a depth of more than 40 inches. Felda soils are in an arenic subgroup and are not calcareous. Manatee soils have a mollic epipedon. Wabasso soils have a spodic horizon.

Typical pedon of Parkwood Variant loamy fine sand, in an area of Parkwood Variant complex, in a wooded area, about 1.5 miles east of Elwood Park and 1.25 miles north of Florida Highway 7, NW1/4SW1/4 sec. 2, R. 18 E., T. 35 S.

A11—0 to 4 inches; black (10YR 2/1) loamy fine sand; weak fine granular structure; very friable; many fine and common medium roots; moderately alkaline, calcareous; gradual wavy boundary.

A12—4 to 9 inches; very dark gray (10YR 3/1) loamy fine sand; weak fine granular structure; very friable; many fine and common medium roots; moderately alkaline, calcareous; clear wavy boundary.

B21tgca—9 to 31 inches; gray (10YR 5/1) fine sandy loam; few fine faint yellowish brown mottles; moderate medium granular structure; friable; few coarse roots; sand grains coated and bridged with clay; moderately alkaline, calcareous; gradual wavy boundary.

B22tgca—31 to 37 inches; gray (10YR 5/1) fine sandy loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium granular structure; friable; few thin lenses or pockets of white (10YR 8/1) calcium carbonate; sand grains coated and bridged with clay; moderately alkaline; clear irregular boundary.

IICr—37 to 80 inches; white (10YR 8/1) soft limestone; massive; firm; about 35 percent hard limestone fragments; most roots do not penetrate this layer; solution holes filled with loamy material and limestone fragments are common.

The A horizon ranges from 6 to 10 inches in thickness. It has no hue (N) or has hue of 10YR; value is 2 or 3, and chroma is 0 to 2; or it has hue of 7.5YR, value of 3, and chroma of 2. Reaction ranges from neutral to mildly alkaline. The A11 horizon is not calcareous in some pedons.

The B2tgca horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or value of 7 or 8 and chroma of 1 or 2; or it has no hue (N), and value is 5 to 8; or it has hue of 2.5Y, value of 7, and chroma of 2 and, in places, yellow and brown mottles. Its texture is sandy loam or fine sandy loam. There are common to many secondary accumulations of calcium carbonate in root channels and in pockets or lenses. Reaction is mildly or moderately alkaline and calcareous.

The IICr horizon is primarily soft and porous but also has hard pockets and fragments. Solution holes, mainly about 6 to 10 inches in diameter, are few to common.

Depth to limestone is highly irregular.

Pinellas series

The Pinellas series consists of poorly drained, moderately permeable soils that formed in sandy and loamy marine sediment. The soils are nearly level. They are in flatwoods. Some areas border sloughs and depressions and generally are long and narrow; others are moderately large. Slopes are 0 to 2 percent. In most years, the water table is within a depth of 10 inches for less than 3 months of the year and within a depth of 10 to 40 inches for 2 to 6 months of the year. These soils are loamy, mixed, hyperthermic Arenic Ochraqualfs.

Pinellas soils are near Bradenton, Chobee, EauGallie, Felda, Floridana, Myakka, Parkwood Variant, and Wabasso soils. Bradenton, Chobee, and Parkwood Variant soils have an A horizon less than 20 inches thick. Chobee soils are very poorly drained and have a mollic epipedon, and Parkwood Variant soils are calcareous throughout. EauGallie, Myakka, and Wabasso soils have a spodic horizon. Felda soils do not have an A2ca horizon. Floridana soils are very poorly drained and have a mollic epipedon.

Typical pedon of Pinellas fine sand, in an idle field, about 2 miles east-southeast of Oneco, SW1/4SW1/4 sec. 16, T. 35 S., R. 18 E.

Ap—0 to 5 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; mixture of organic matter and uncoated sand grains; many fine roots; medium acid; clear wavy boundary.

A21—5 to 11 inches; grayish brown (10YR 5/2) fine sand; many fine faint light gray and dark grayish brown mottles; single grained; loose; few fine roots; slightly acid; clear wavy boundary.

A22ca—11 to 15 inches; dark grayish brown (10YR 4/2) fine sand; few fine distinct yellowish brown (10YR 5/4) mottles; single grained; loose; moderately alkaline; calcareous; gradual wavy boundary.

A23ca—15 to 33 inches; gray (10YR 6/1) fine sand; common medium distinct brownish yellow (10YR 6/6) and yellowish brown (10YR 5/6) mottles; weak fine granular structure; very friable; secondary accumulations of carbonates occur in interstices between sand grains; moderately alkaline; calcareous; gradual wavy boundary.

B2tg—33 to 45 inches; gray (10YR 6/1) sandy clay loam; common medium distinct brownish yellow (10YR 6/6) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; slightly sticky, slightly plastic; sand grains coated and bridged with clay; common pockets of light gray fine sand; secondary accumulations of carbonates in some old root channels; moderately alkaline; clear irregular boundary.

Cg—45 to 53 inches; light gray (10YR 7/2) fine sand; many coarse prominent brownish yellow (10YR 6/8) mottles; single grained; loose; few pockets loamy fine sand; moderately alkaline; calcareous; gradual wavy boundary.

IIC—53 to 60 inches; light gray (10YR 7/2) fine sand mixed with many white shell fragments; single grained; loose; many small unbroken shells; moderately alkaline; calcareous.

The solum is less than 60 inches thick. Reaction in the A1 or Ap horizon and in the upper part of the A2 horizon ranges from medium acid to mildly alkaline. The lower part of the A2 horizon is mildly to strongly alkaline and calcareous. The total thickness of the A horizon ranges from 20 to 40 inches.

The A1 or Ap horizon has no hue (N) or has hue of 10YR; value is 2 to 4, and chroma is 1 or 0. An A1 horizon that has value of 3.5 or less is generally less than 6 inches thick. The A2 horizon has hue of 10YR, value of 4, and chroma of 2 or value of 5 to 8 and chroma of 1 to 3; or hue of 2.5Y, value of 5 to 7, and chroma 2 and, in places, mottles of gray, brown, or yellow. Subhorizons of the A2 horizon that have a secondary accumulation of carbonates are firm to loose in consistence.

The B2tg horizon has hue of 10YR to 5Y, value of 5 to 8, and chroma of 1 and, in places, mottles or chroma of 2 and brown, yellow, olive, or gray mottles. It is fine sandy loam, sandy loam, or sandy clay loam. Reaction ranges from neutral to strongly alkaline and calcareous.

The Cg and IIC horizons have colors that are similar to those of the B2tg horizon. The Cg horizon does not have shell fragments. The Cg and IIC horizons are fine sand or sand. In some pedons there is neither a Cg nor a IIC horizon.

Pomello series

The Pomello series consists of deep, moderately well drained soils that formed in thick deposits of sandy marine sediment. Permeability is moderately rapid. The soils are nearly level. They are on low ridges and knolls in flatwoods. Slopes range from 0 to 2 percent. The water table is at a depth of 24 to 40 inches for 1 to 4 months in the wet season and at a depth of 40 to 60 inches in the drier seasons. These soils are sandy, siliceous, hyperthermic Arenic Haplohumods.

Pomello soils are near Cassia, EauGallie, Myakka, Waveland, and Zolfo soils. Cassia soils are on slightly lower elevations than the Pomello soils, are somewhat poorly drained, and have a spodic horizon above a depth of 30 inches. Zolfo soils are better drained and have a spodic horizon below a depth of 50 inches. EauGallie, Myakka, and Waveland soils are poorly drained. EauGallie and Myakka soils have an A horizon that is less than 30 inches thick, and Waveland soils have ortstein.

Typical pedon of Pomello fine sand, in an area of undisturbed natural vegetation, about 3.25 miles south of Myakka City, SW1/4NE1/4 sec. 36, T. 36 S., R. 21 E.

A1—0 to 2 inches; gray (10YR 5/1) fine sand; weak fine granular structure; very friable; many fine roots; mixed uncoated sand grains and organic matter with a salt and pepper appearance; very strongly acid; clear smooth boundary.

A2—2 to 46 inches; white (10YR 8/2) fine sand; single grained; loose; few fine medium and coarse roots; few dark grayish brown (10YR 4/2) streaks in old root channels; very strongly acid; abrupt wavy boundary.

B21h—46 to 51 inches; black (5YR 2/1) fine sand; weak fine granular structure; very friable; few fine and medium roots; sand grains coated with organic matter; common dark reddish brown (5YR 2/2) pockets and weakly cemented bodies; very strongly acid; clear wavy boundary.

B22h—51 to 80 inches; dark reddish brown (5YR 2/2) fine sand; massive in places parting to weak fine granular structure; very friable; few medium roots; few weakly cemented fragments; sand grains thinly coated with organic matter; very strongly acid; gradual wavy boundary.

The solum is more than 40 inches thick and commonly exceeds 60 inches in thickness. Reaction ranges from very strongly acid to medium acid.

The A1 horizon has no hue (N) or has hue of 10YR; value is 4 to 6, and chroma is 1 or 0. It ranges from 1 to 5 inches in thickness. The A2 horizon has no hue (N) or has hue of 10YR; value is 6 to 8, and chroma is 2 or 1. Total thickness of the A horizon ranges from 30 to 50 inches.

The B2h horizon has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 3, and chroma of 2 to 4. In some pedons there are few to common, small to large pockets of material from the A2 horizon in this horizon. In some pedons the B2h horizon is weakly cemented in less than 50 percent of the pedon or has weakly cemented fragments. It ranges from 6 to more than 20 inches in thickness.

The B3 horizon has hue of 10YR, value of 3 or 4, and chroma of 3; or hue of 7.5YR, value of 4, and chroma of 2 to 4. The B3&Bh horizon has a matrix that is the same color as that of the B3 horizon and has darker colored,

weakly cemented fragments from the Bh horizon. There is neither a B3 nor a B3&Bh horizon in some pedons.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. There is no C horizon in some pedons

Pomona series

The Pomona series consists of poorly drained soils that formed in sandy and loamy marine deposits. Permeability is moderately slow. The soils are nearly level. They are on broad flats in the flatwoods. They are in the eastern half of the county, generally above an elevation of 40 feet. Slope is less than 2 percent. In most years, if the soils are not drained, the water table is at a depth of less than 10 inches for 1 to 3 months of the year and at a depth of 10 to 40 inches for 6 months or more of the year. These soils are sandy, siliceous, hyperthermic Ultic Haplaquods.

Pomona soils are near Anclote, Delray, Myakka, Ona, Wabasso, Wauchula, and Waveland soils. Anclote and Delray soils have a mollic epipedon and do not have a spodic horizon. Sellers soils have a very thick umbric epipedon and do not have an argillic horizon. Myakka and Ona soils do not have an argillic horizon. Wabasso and Wauchula soils have an argillic horizon at a depth between 20 and 40 inches. Waveland soils have ortstein and do not have an argillic horizon.

Typical pedon of Pomona fine sand, in an area of Delray-Pomona complex, in a pasture, about 3.5 miles south of Myakka City, NW1/4SE1/4 sec. 18, T. 36 S., R. 21 E.

A1—0 to 6 inches; black (10YR 2/1) rubbed, fine sand; weak fine crumb structure; very friable; many uncoated sand grains; many fine roots; extremely acid; clear wavy boundary.

A21—6 to 13 inches; gray (10YR 6/1) fine sand; common medium distinct very dark gray (10YR 3/1) mottles; single grained; loose; few fine roots; very strongly acid; clear wavy boundary.

A22—13 to 22 inches; light gray (10YR 7/1) fine sand; few common distinct very dark gray (10YR 3/1) mottles; single grained; loose; many fine roots; strongly acid; clear wavy boundary.

B21h—22 to 26 inches; dark reddish brown (5YR 3/2) fine sand; weak medium subangular blocky structure; very friable; many fine and medium roots; most sand grains are coated with organic matter; very strongly acid; clear wavy boundary.

B22h—26 to 32 inches; dark reddish brown (5YR 3/3) fine sand; common medium distinct dark reddish brown (5YR 3/2) mottles; moderate medium granular structure; very friable; many fine and medium roots; most sand grains are coated with colloidal organic matter; very strongly acid; clear wavy boundary.

B3—32 to 36 inches; dark brown (10YR 3/3) fine sand; common medium distinct dark brown (7.5YR 3/2) and very dark grayish brown (10YR 3/2) mottles; single grained; loose; common fine roots; very strongly acid; clear wavy boundary.

A'2—36 to 51 inches; pale brown (10YR 6/3) fine sand; common medium distinct dark brown (7.5YR 3/2) mottles; single grained; loose; common fine roots; strongly acid; clear wavy boundary.

B'2tg—51 to 60 inches; olive gray (5Y 5/2) fine sandy loam; weak medium subangular blocky structure; very friable; common fine roots; sand grains are coated and bridged with clay; very strongly acid; clear wavy boundary.

Cg—60 to 80 inches; gray (N 6/0) loamy fine sand; massive; friable; common fine roots; very strongly acid.

The solum is 60 inches or more thick. The Bh horizon is at a depth of less than 30 inches. The B'2t horizon is at a depth of more than 40 inches. Reaction ranges from extremely acid to strongly acid in all horizons.

The A1, or Ap, horizon has no hue (N) or has hue of 10YR; value is 2 to 4, and chroma is 1 or 0. In undisturbed areas, the horizon is a mixture of uncoated sand grains and small pieces of organic material. The A2 horizon has no hue (N) or has hue of 10YR; value is 5 to 8, and chroma is 1 or 2; or it has no hue (N), and value is 5 to 8. In some pedons the A2 horizon has a few mottles in shades of yellow and brown. In other pedons it has vertical streaks that have hue of 10YR, value of 2 to 4, and chroma of 1. The A horizon is sand or fine sand except for the A1 or Ap horizon, which is fine sand. Total thickness of the A horizon ranges from 20 to 30 inches.

The B2h horizon has hue of 5YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 1 to 4; hue of 10YR, value of 2, and chroma of 1 or 2; hue of 7.5YR, value of 3, and chroma of 2; or no hue (N) and value of 2. Its texture is sand or fine sand, and the sand grains are coated with colloidal organic material.

The B3 horizon has hue of 10YR, value of 3 or 4, and chroma of 3; or hue of 7.5YR, value of 3, and chroma of 2 or value of 4, and chroma of 2 to 4. Its texture is sand or fine sand, and the sand grains are uncoated.

The A'2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 3 or value of 4 and chroma of 2. Its texture is sand or fine sand. There is no A'2 horizon in a few pedons.

The B'tg horizon has hue of 10YR or 5Y, value of 5 to 7, and chroma of 1 or 2. It generally has mottles in shades of yellow, brown, or red. Its texture is sandy loam, fine sandy loam, or sandy clay loam. In the lower part there are pockets and lenses of coarser or finer textured material.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8, and chroma of 1 or 2; or it has no hue (N), and value is 5 to 8. It generally has mottles in shades of

yellow, brown, or red. Its texture is sand, fine sand, loamy sand, or loamy fine sand. The horizon is at a depth of 80 inches or more in some pedons.

St. Johns series

The St. Johns series consists of poorly drained, moderately permeable soils that formed in thick deposits of marine sand. The soils are nearly level to gently sloping. They are in broad areas of flatwoods and on side slopes adjacent to drainageways. In most years, the water table is within a depth of 15 inches for 2 to 6 months of the year and at a depth of 15 to 30 inches for more than 6 months of the year. These soils are sandy, siliceous, hyperthermic Typic Haplaquods.

St. Johns soils are near Cassia, Myakka, Ona, Wabasso, and Waveland soils. St. Johns soils differ from all the associated soils except Ona soils by having an umbric epipedon. Cassia soils are moderately well drained and somewhat poorly drained. Wabasso soils have an argillic horizon. Ona soils do not have an A2 horizon. Waveland soils have a cemented Bh horizon below a depth of 30 inches.

Typical pedon of St. Johns fine sand, in a cutover wooded area where the slope is 3 percent, 100 feet northwest of graded road, NE1/4SW1/4 sec. 16, T. 33 S., R. 21 E.

A11—0 to 7 inches; black (10YR 2/1) fine sand; weak medium crumb structure; friable; many fine and medium roots; many uncoated sand grains; strongly acid; gradual smooth boundary.

A12—7 to 13 inches; very dark gray (10YR 3/1) fine sand; weak fine crumb structure; very friable; common fine roots; common uncoated sand grains; strongly acid; gradual wavy boundary.

A2—13 to 28 inches; light gray (10YR 6/1) fine sand; single grained; loose; few fine roots; strongly acid; clear wavy boundary.

B21h—28 to 41 inches; black (10YR 2/1) fine sand; few fine faint black splotches; weak fine subangular blocky structure; friable; many fine and medium roots; very strongly acid; gradual wavy boundary.

B22h—41 to 53 inches; black (10YR 2/1) fine sand; few fine faint very dark grayish brown mottles; weak fine subangular blocky structure; friable; very strongly acid; gradual wavy boundary.

B23h—53 to 60 inches; very dark gray (10YR 3/1) fine sand; weak medium crumb structure; friable; very strongly acid; gradual wavy boundary.

A'2—60 to 68 inches; dark gray (10YR 4/1) fine sand; common fine faint very dark gray mottles; single grained; loose; very strongly acid; gradual wavy boundary.

B'2h—68 to 80 inches; black (10YR 2/1) fine sand; weak medium crumb structure; friable; very strongly acid.

Reaction ranges from very strongly acid to medium acid. The texture is sand or fine sand throughout, except for the A1 horizon, which is fine sand.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It is 10 to 13 inches thick. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is 7 to 15 inches thick. Total thickness of the A horizon is less than 30 inches.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 3 or less. It is 10 to 38 inches thick.

The A'2 horizon has hue of 5YR or 10YR, value of 4 to 6, and chroma of 2 or less. It ranges to 8 inches in thickness. The B'2h horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It extends to a depth of 80 inches or more.

In some pedons there is no second sequum of A'2 and B'2h horizons, but there is a B3 horizon that has hue of 10YR, value of 4 to 6, and chroma of 3 or 4.

In some pedons there is a C horizon that has hue of 10YR, value of 6 or 7, and chroma of 1 or 2.

Tavares series

The Tavares series consists of moderately well drained, very rapidly permeable soils that formed in thick beds of sandy marine or aeolian sediment. The soils are nearly level to gently sloping. They are on knolls and ridges in the western and central parts of the county. In a few areas the soils are on benches mainly along the Little Manatee River and along the larger streams and rivers. In most years, if the soils are not drained, the water table is at a depth of 40 to 60 inches for 6 to 10 months of the year and at a depth below 60 inches during very dry periods. These soils are hyperthermic, uncoated Typic Quartzipsamments.

Tavares soils are near Adamsville Variant, EauGallie, Myakka, Orlando, and Zolfo soils. Adamsville Variant soils are at lower elevations and are somewhat poorly drained. EauGallie and Myakka soils are poorly drained and have a spodic horizon. Orlando soils have an umbric epipedon. Zolfo soils have a spodic horizon.

Typical pedon of Tavares fine sand, in an orange grove, about 2 miles southeast of Manhattan along Florida Highway 675, SW1/4SW1/4 sec. 28, T. 34 S., R. 20 E.

Ap—0 to 6 inches; very dark gray (10YR 3/1) fine sand; weak medium granular structure; loose; many fine, medium, and coarse roots; many uncoated sand grains; strongly acid; gradual wavy boundary.

C1—6 to 13 inches; yellowish brown (10YR 5/4) fine sand; weak medium granular structure; loose; many fine and common coarse roots; few fine carbon particles; sand grains slightly coated; strongly acid; gradual wavy boundary.

C2—13 to 34 inches; light yellowish brown (10YR 6/4) fine sand; few fine faint light gray and brownish

yellow mottles in lower 2 inches of horizon; weak medium granular structure; loose; common fine and coarse roots; few fine scattered carbon particles; dark brown staining along root channels; strongly acid; gradual wavy boundary.

C3—34 to 56 inches; yellowish brown (10YR 5/6) fine sand; weak medium granular structure; loose; few coarse roots; few fine faint gray splotches; sand grains lightly coated; very strongly acid; gradual wavy boundary.

C4—56 to 76 inches; very pale brown (10YR 7/3) fine sand; common fine and medium distinct strong brown (7.5YR 5/6) mottles; weak medium granular structure; loose; few coarse roots; many uncoated sand grains; strongly acid; gradual wavy boundary.

C5—76 to 86 inches; white (10YR 8/1) fine sand; few fine faint yellowish brown and very pale brown mottles; single grained; loose; few coarse roots; strongly acid.

These soils are fine sand to a depth of 80 inches or more. Reaction ranges from very strongly acid to medium acid in all horizons. The content of silt and clay in the 10- to 40-inch control section is less than 5 percent.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2 or value of 5 and chroma of 1; or hue of 2.5Y, value of 3 or 4, and chroma of 2. It is 3 to 8 inches thick.

The C horizon in the upper part has hue of 10YR, value of 6 or 7, and chroma of 3 or 4 or value of 5 and chroma of 2 to 8. In the lower part it has hue of 10YR, value of 6, and chroma of 1 to 3 or value of 7 and chroma of 1 to 4 or value of 8 and chroma of 1 or 2. In the lower part there are brown, yellow, or red mottles. In some pedons, large splotches or mottles that have chroma of 2 or 1 are within a depth of 40 inches. The colors are those of the sand grains and are not indicative of wetness.

The lower part of the C horizon, in pedons on benches along the larger streams and rivers, is at a depth of more than 40 inches; it is extremely hard (iron-cemented) sand or fine sand. It has hue of 10YR, value of 5 to 7, and chroma of 3 to 8.

Tomoka series

The Tomoka series consists of very poorly drained soils that formed in well decomposed organic material and in the underlying sandy and loamy mineral material. Permeability is moderate to moderately rapid. The soils are nearly level. They are in freshwater marshes. Slopes are less than 2 percent. In undrained areas the water table is at or above the surface except during extended dry periods. These soils are loamy, siliceous, dysic, hyperthermic Terric Medisaprists.

Tomoka soils are near Bradenton, Delray, Felda, and Floridana soils. All the associated soils are mineral soils and except for the Delray and Floridana soils are better drained than the Tomoka soils.

Typical pedon of Tomoka muck, about 5 miles southwest of Myakka City and 0.25 mile south of Cason Lake, NW1/4NW1/4 sec. 29, T. 36 S., R. 21 E.

Oa1—0 to 12 inches; black (5YR 2/1) muck; moderate medium granular structure; friable; extremely acid; gradual wavy boundary.

Oa2—12 to 18 inches; dark reddish brown (5YR 3/2) muck; moderate medium granular structure; friable; extremely acid; gradual wavy boundary.

Oa3—18 to 25 inches; black (5YR 2/1) muck; moderate medium granular structure; friable; extremely acid; gradual wavy boundary.

Oa4—25 to 28 inches; black (5YR 2/1) muck; common coarse distinct gray (10YR 5/1) sand lenses; moderate medium granular structure; friable; extremely acid; clear wavy boundary.

IIC1—28 to 32 inches; dark gray (10YR 4/1) and light brownish gray (10YR 6/2) sand; single grained; loose; strongly acid; clear wavy boundary.

IIC2—32 to 35 inches; black (10YR 2/1) sand and loamy sand; single grained; loose; medium acid; abrupt wavy boundary.

IIIC3—35 to 40 inches; gray (10YR 5/1) sandy clay loam; many fine and medium distinct very dark gray (10YR 3/1) and light gray (10YR 6/1) mottles and streaks of sand; massive; friable; slightly acid; gradual wavy boundary.

IIIC4—40 to 50 inches; gray (10YR 5/1) sandy clay loam; massive; friable; slightly acid; gradual wavy boundary.

IIIC5—50 to 75 inches; gray (10YR 5/1) sandy clay loam with common light gray (10YR 6/1) sand pockets and lenses; massive; friable; neutral.

Reaction of the Oa horizon is less than 4.5 in 0.01*M* $CaCl_2$ and from 5.5 to 6.5 in field test. The IIC and IIIC horizons range from very strongly acid to neutral.

The Oa horizon has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; hue of 5YR, value of 3, and chroma of 2 or 3; or no hue (N) and value of 2. It ranges from 16 to 40 inches in thickness.

The IIC horizon has hue of 10YR or 2.5Y, value of 2 to 6, and chroma of 2 or 1. It ranges from sand to loamy fine sand. The IIIC horizon has hue of 10YR or 2.5Y, value of 2 to 7, and chroma of 2 or 1. It is sandy loam, fine sandy loam, or sandy clay loam. In many pedons there are lenses and pockets of finer or coarser textured material in the lower IIIC horizons.

Wabasso series

The Wabasso series consists of poorly drained, slowly permeable to very slowly permeable soils that formed in sandy and loamy marine sediment. The soils are nearly level. They are in areas of low, broad flatwoods on flood plains. In most years, if the soils are not drained, the water table is at a depth of 10 to 40 inches for more

than 6 months of the year. It is at a depth of less than 10 inches for less than 60 days in wet seasons and is at a depth of more than 40 inches in very dry seasons. In some areas on flood plains, the soils are flooded frequently, and in other areas they are flooded only rarely. Slopes range from 0 to 2 percent. These soils are sandy, siliceous, hyperthermic Alfic Haplaquods.

Wabasso soils are near Bradenton, limestone substratum, Delray, EauGallie, Felda, Floridana, and Palmetto soils. Bradenton, limestone substratum, soils do not have a sandy surface layer that is more than 20 inches thick or a spodic horizon. Delray and Floridana soils have a mollic epipedon, do not have a spodic horizon, and are in depressions. EauGallie soils have an argillic horizon at a depth between 40 and 80 inches. Felda soils do not have a spodic horizon. EauGallie and Felda soils are in the same positions on the landscape as Wabasso soils. Palmetto soils do not have a spodic horizon and are in poorly defined drainageways and sloughs.

Typical pedon of Wabasso fine sand, in an improved pasture, 1 mile north of Florida Highway 64, 1 mile southwest of Manatee River, NW1/4NW1/4 sec. 25, T. 34 S., R. 18 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) fine sand; mixture of organic matter and light gray sand grains has a salt and pepper appearance; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.

A21—7 to 12 inches; gray (10YR 5/1) fine sand; single grained; loose; common fine and medium roots; common uncoated sand grains; strongly acid; clear smooth boundary.

A22—12 to 21 inches; light gray (10YR 7/1) fine sand; single grained; loose; medium vertical dark gray and very dark gray streaks in the matrix and along root channels; few medium roots; very strongly acid; abrupt wavy boundary.

B21h—21 to 25 inches; black (5YR 2/1) fine sand; massive parting to moderate fine granular; sand grains are well coated with organic matter; few fine roots; very strongly acid; clear wavy boundary.

B22h—25 to 28 inches; dark reddish brown (5YR 2/2) fine sand; massive parting to weak fine granular; firm; few fine and medium roots; many sand grains coated with organic matter; very strongly acid; clear wavy boundary.

B3—28 to 31 inches; brown (10YR 4/3) fine sand; few medium faint very dark brown streaks and mottles; single grained; loose; many sand grains are thinly coated with organic matter; very strongly acid; gradual wavy boundary.

A'2—31 to 37 inches; pale brown (10YR 6/3) fine sand; few fine faint streaks of very dark grayish brown; single grained; loose; medium acid; gradual wavy boundary.

B'21t—37 to 46 inches; grayish brown (10YR 5/2) sandy loam; few medium prominent red (2.5YR 4/8) and distinct brownish yellow (10YR 6/8) mottles; weak fine granular structure; friable; sand grains are bridged and coated with clay; few fine light gray (10YR 7/1) sand lenses; slightly acid; gradual wavy boundary.

B'22t—46 to 65 inches; gray (10YR 6/1) sandy clay loam; few coarse distinct reddish yellow (7.5YR 6/6), strong brown (7.5YR 5/8), and dark brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; firm; sand grains are distinctly coated and bridged with clay; few thin patchy clay films on ped faces and in root channels; slightly acid; gradual wavy boundary.

Cg—65 to 80 inches; gray (10YR 6/1) sand mixed with many fine shell fragments; brownish yellow and strong brown mottles; single grained; mildly alkaline.

Reaction ranges from neutral to very strongly acid in the A, B2h, and B3 horizons and from medium acid to mildly alkaline in the horizons below.

The Ap, or A1, horizon has no hue (N) or has hue of 10YR; value is 2 or 3, and chroma is 1 or 2. It generally has a salt and pepper appearance where undisturbed. It ranges from 3 to 8 inches in thickness. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Total thickness of the A horizon is 16 to 30 inches.

The B2h horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 3 or less. It is 7 to 18 inches thick.

The B3 horizon has hue of 5YR to 10YR, value of 4, and chroma of 2 to 4. It is fine sand or sand and ranges to 6 inches in thickness. The B3&Bh horizon, where present, has matrix colors similar to those of the B3 horizon and also has black or dark reddish brown weakly cemented Bh fragments.

The A'2 horizon has no hue (N) or has hue of 10YR or 2.5Y; value is 5 to 8, and chroma is 3 or less. It is fine sand or sand and ranges to 14 inches in thickness.

The B'2t horizon has hue of 10YR, 2.5Y, and 5Y, value of 4 to 7, and chroma of 1 to 8. It has gray, brown, yellow, and red mottles. It is fine sandy loam, sandy loam, or sandy clay loam. In some pedons there are few to common, fine and medium nodules of white (10YR 8/1) carbonatic material. The B'2t horizon is at a depth between 26 and 40 inches. It is 15 to 30 inches thick.

The Cg horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 1 or 0. It is a mixture of sand or loamy sand and shell fragments.

Wabasso Variant

Wabasso Variant soils are poorly drained. They formed in sandy and loamy marine sediment overlying limestone. Permeability is slow to moderately slow. The soils are nearly level. They are in areas of low, broad flatwoods. Slopes are 0 to 2 percent. In most years, if the soils are

not drained, the water table is at a depth of 10 to 40 inches for more than 6 months of the year. It is at a depth of less than 10 inches for 1 to 4 months in wet seasons and at a depth of more than 40 inches in very dry seasons. These soils are sandy, siliceous, hyperthermic Alfic Haplaquods.

Wabasso Variant soils are near EauGallie, Delray, Broward Variant, Chobee, and Myakka soils. EauGallie soils have an argillic horizon that begins at a depth of 40 to 80 inches. Delray and Chobee soils do not have a spodic horizon but have a mollic epipedon. Broward Variant and Myakka soils do not have an argillic horizon. All the associated soils except Broward Variant soils do not have limestone.

Typical pedon of Wabasso Variant fine sand, in a partly cleared area, about 2 miles west of Oneco and 0.3 mile south of Cedar Hammock Drainage Canal, SE1/4NW1/4 sec. 15, T. 35 S., R. 17 E.

A1—0 to 4 inches; black (10YR 2/1) fine sand, rubbed; unrubbed organic matter and light gray sand grains have a salt and pepper appearance; weak fine granular structure; friable; many fine and common medium roots; very strongly acid; clear wavy boundary.

A21—4 to 11 inches; gray (10YR 5/1) fine sand; common medium distinct very dark gray (10YR 3/1) streaks; single grained; loose; few fine and medium roots; very strongly acid; clear wavy boundary.

A22—11 to 23 inches; light gray (10YR 6/1) fine sand; few fine faint dark gray mottles; single grained; loose; few fine roots; strongly acid; clear smooth boundary.

B21h—23 to 30 inches; dark reddish brown (5YR 3/2) fine sand; weak medium subangular blocky structure; friable; most sand grains are coated with organic matter; few fine roots; neutral; clear wavy boundary.

B21tg—30 to 36 inches; mottled yellowish brown (10YR 5/6), brownish yellow (10YR 6/6), and light brownish gray (10YR 6/2) sandy clay loam; weak medium subangular blocky structure; friable; few fine roots; thin clay films on ped faces; mildly alkaline; abrupt wavy boundary.

IIR—36 to 56 inches; white (10YR 8/2) limestone that can be dug with light, powered equipment such as a backhoe.

IIIC—56 to 80 inches; light gray (10YR 7/1) and white (10YR 8/1) fine sand; single grained; loose; common to many carbonatic nodules one-fourth inch to 3 inches in diameter; moderately alkaline.

The A1, or Ap, horizon has hue of 10YR, value of 2, and chroma of 1 or value of 3 or 4 and chroma of 1 or 2. In undisturbed areas it generally has a salt and pepper appearance. It is less than 8 inches thick.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 5 or 6, and chroma of 2. Total thickness of the A horizon is less than 30 inches. The A horizon is sand or fine sand. It is very strongly acid to slightly acid.

The B2h horizon has hue of 10YR, value of 2, and chroma of 1 or value of 3 and chroma of 2 or 3; or hue of 5YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 2 to 4; or hue of 7.5YR, value of 3, and chroma of 2. It is fine sand or sand. It ranges from 4 to 14 inches in thickness. The B3 horizon has hue of 10YR, value of 4, and chroma of 3 or 4; or hue of 7.5YR, value of 4, and chroma of 2 to 4; or hue of 5YR, value of 4, and chroma of 3 or 4. Fragments of material from the Bh horizon that have the same color as the B2h horizon are scattered throughout the B3&Bh horizon. Reaction ranges from very strongly acid to neutral. There is no B3 horizon or B3&Bh horizon in some pedons.

The B2tg horizon has hue of 10YR, value of 5 to 7, and chroma of 4 or less; or hue of 2.5Y, value of 5 or 6, and chroma of 2; or no hue (N) and value of 5 or 6; or hue of 5Y, value of 5 to 7, and chroma of 1; or it is mottled with brown, yellow, or gray. It is fine sandy loam or sandy clay loam. Reaction is mildly alkaline or moderately alkaline.

The IIR horizon is limestone of varying degrees of hardness. It begins at a depth of less than 40 inches. Commonly, the limestone can be chipped but not dug with a spade. It can be dug with power machinery. It generally is about 12 to 30 inches thick, but its thickness varies greatly within short distances.

The IIICg horizon is similar in color to the B2tg horizon. The IIICg horizon also has hue of 5Y or 5GY, value of 5 to 7, and chroma of 1. It ranges from fine sand to sandy clay loam. Reaction is mildly alkaline or moderately alkaline.

Wauchula series

The Wauchula series consists of nearly level, poorly drained, moderately permeable soils that formed in sandy and loamy marine deposits. The soils are in broad areas in flatwoods. Slopes are less than 2 percent. These soils are sandy, siliceous, hyperthermic Ultic Haplaquods.

Wauchula soils are near Floridana, Immokalee, Myakka, Okeelanta, and Ona soils. Floridana and Okeelanta soils are very poorly drained. Floridana soils have a mollic epipedon but do not have a spodic horizon. Okeelanta soils are organic. Immokalee, Myakka, and Ona soils do not have an argillic horizon below the spodic horizon.

Typical pedon of Wauchula fine sand, about 3.5 miles east of Lorraine and 1.25 miles north of Florida Highway 70, NE1/4NE1/4 sec. 19, T. 35 S., R. 20 E.

A11—0 to 3 inches; black (10YR 2/1) fine sand; moderate fine granular structure; very friable; many fine and few medium roots; extremely acid; clear smooth boundary.

A12—3 to 7 inches; very dark gray (10YR 3/1) fine sand, rubbed; weak medium granular structure; very friable; common fine and medium roots; common coarse faint dark gray splotches; extremely acid; gradual wavy boundary.

A21—7 to 13 inches; gray (10YR 5/1) fine sand; many coarse faint dark gray mottles and streaks; single grained; loose; few fine and many medium roots; medium acid; gradual wavy boundary.

A22—13 to 20 inches; light gray (10YR 6/1) fine sand; single grained; loose; few fine and medium roots; many medium distinct very dark gray (10YR 3/1) vertical streaks and common coarse faint gray splotches; slightly acid; abrupt irregular boundary.

B21h—20 to 25 inches; dark reddish brown (5YR 2/2) fine sand; moderate medium granular structure; firm; common fine roots; sand grains well coated with colloidal organic matter; very strongly acid; clear irregular boundary.

B22h—25 to 29 inches; dark brown (7.5YR 3/2) fine sand; moderate medium granular structure; very friable; less than 10 percent uncoated sand grains in matrix color; common fine roots; common coarse distinct black (5YR 2/1) weakly cemented bodies, strongly acid; gradual broken boundary.

A'2—29 to 34 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine and medium roots; few fine and medium distinct black (10YR 2/1) streaks; few iron concretions 1 inch in diameter at upper boundary of horizon; strongly acid; abrupt wavy boundary.

B'21tg—34 to 49 inches; light gray (10YR 6/1) sandy clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; slightly sticky; many common and fine decaying roots; sand grains bridged and coated with clay; many fine pores; very strongly acid; gradual wavy boundary.

B'22tg—49 to 71 inches; light gray (10YR 6/1) sandy clay loam; many coarse distinct yellowish brown (10YR 5/6) and many coarse distinct red (2.5YR 4/8) mottles; weak coarse subangular blocky structure; friable; common fine decaying roots; few loamy fine sand lenses; common fine pores; very strongly acid; clear wavy boundary.

Cg—71 to 80 inches; light gray (5Y 7/1) loamy fine sand; moderate medium granular structure; friable; common medium distinct streaks of fine sand; very strongly acid.

Reaction is extremely acid to slightly acid in the A horizon, extremely acid to strongly acid in the Bh horizon, and strongly acid to very strongly acid in the A'2, B'2t, and Cg horizons.

The A1 horizon has hue of 10YR, value of 1 to 4, and chroma of 1 or value of 4 and chroma of 2. It is 4 to 9 inches thick.

The A2 horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 1 or 2. It has gray, yellow, red, or brown mottles in some pedons. It is 10 to 21 inches thick.

The Bh horizon has hue of 10YR, 7.5YR, or 5YR, value of 3, and chroma of 4. It is fine sand, sand, or loamy fine sand. It is 6 to 12 inches thick.

The A'2 horizon has hue of 10YR, value of 5, and chroma of 1 or value of 6 and chroma of 1 to 3 or value of 7 and chroma of 1 to 4. It is fine sand or sand. It is 0 to 6 inches thick.

The B'tg horizon begins at a depth of less than 40 inches. It has hue of 10YR, value of 4 to 6, and chroma of 1 or 2; or it has hue of 2.5Y, value of 4 to 6, and chroma of 2; or it has no hue (N) and value of 5 or 6. It has brown, yellow, gray, or red mottles. It is sandy loam, fine sandy loam, or sandy clay loam. In some pedons it has lenses of sandy material.

The Cg horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 or 0. It is sand, fine sand, or loamy fine sand.

Waveland series

The Waveland series consists of nearly level, poorly drained soils that formed in marine sandy and loamy sediment. Permeability is very slow to slow. The soils are in broad areas of flatwoods. The water table is within a depth of 10 inches for 1 to 4 months of the year and within a depth of 40 inches for 6 months or more of the year. Slopes range from 0 to 2 percent. These soils are sandy, siliceous, hyperthermic, ortstein Arenic Haplaquods.

Waveland soils are near Delray, Myakka, Ona, Pomello, Pomona, and Zolfo soils. All the associated soils do not have ortstein. Pomello and Zolfo soils are better drained than Waveland soils. Ona soils do not have an A2 horizon. Myakka soils have an A horizon less than 30 inches thick. Pomona soils have an argillic horizon below the spodic horizon. Delray soils have a mollic epipedon and do not have a spodic horizon.

Typical pedon of Waveland fine sand, in an improved pasture, about 0.75 mile north of Parkton, NE1/4NE1/4 sec. 35, T. 36 S., R. 22 E.

A1p—0 to 5 inches; black (10YR 2/1) fine sand, rubbed; moderate medium granular structure; very friable; many fine and medium roots; mixed organic matter and uncoated fine sand grains; very strongly acid; clear smooth boundary.

A12—5 to 8 inches; dark gray (10YR 4/1) sand; few medium distinct very dark gray (10YR 3/1) streaks along root channels; weak medium granular structure; very friable; many fine and medium roots; many uncoated sand grains; medium acid; gradual wavy boundary.

A21—8 to 21 inches; grayish brown (10YR 5/2) sand; few fine and medium distinct very dark gray (10YR 3/1) streaks along root channels; single grained; loose; common fine roots; slightly acid; gradual wavy boundary.

A22—21 to 32 inches; light gray (10YR 7/1) fine sand; common medium distinct very dark gray (10YR 3/1) streaks along root channels; single grained; loose; common fine roots; neutral; abrupt wavy boundary.

B21h—32 to 40 inches; black (10YR 2/1) sand; massive; very firm; weakly cemented; few fine roots; sand grains well coated with organic matter; very strongly acid; gradual wavy boundary.

B22h—40 to 51 inches; black (5YR 2/1) sand; common coarse faint black (10YR 2/1) very firm fragments; massive; firm; weakly cemented; sand grains well coated with organic matter; strongly acid; clear wavy boundary.

C1—51 to 57 inches; dark grayish brown (10YR 4/2) sand; single grained; loose; strongly acid; gradual wavy boundary.

C2—57 to 66 inches; grayish brown (2.5Y 5/2) sand; single grained; loose; strongly acid; gradual wavy boundary.

C3—66 to 80 inches; olive gray (5Y 5/2) sand with few scattered pockets of sandy loam; single grained in sand part; loose; weak medium subangular blocky structure in sandy loam part; very friable; sand grains coated with clay in sandy loam part; strongly acid.

The A1 or Ap horizon when rubbed has hue of 10YR, value of 2 to 4, and chroma of 1. Where the value is less than 3.5, the horizon is less than 10 inches thick. The unrubbed material has a salt and pepper appearance. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 1 or 2. The combined thickness of the A horizon ranges from 30 to 50 inches. Reaction ranges from extremely acid to neutral.

In some pedons there is a B1h horizon that has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. The B1h horizon does not meet the requirements of a spodic horizon. Reaction ranges from extremely acid to medium acid. The horizon ranges to 4 inches in thickness.

The B2h horizon has hue of 5YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 2 to 4; hue of 7.5YR, value of 3, and chroma of 2; or hue of 10YR, value of 2, and chroma of 1 or 2. In some pedons there are pockets of material from the A2 horizon in this horizon.

These soils range from noncemented to weakly cemented. In most pedons, the cementation varies in thickness. Consistence ranges from very firm in the parts that are weakly cemented to very friable in the parts that are not cemented. In some pedons few to common vertical streaks of the Bh horizon extend into the C horizon. The Bh horizon varies greatly in thickness within short distances.

The B3 horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4; or hue of 7.5YR, value of 3, and chroma of 3 or value of 4 and chroma of 2 to 4. The B3&Bh horizon has weakly cemented fragments of the Bh horizon and is similar in color to that horizon. The Bh horizon is fine sand, sand, loamy fine sand, or loamy sand. Reaction is extremely acid to strongly acid. There is no B3&Bh horizon in some pedons.

The C horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 to 4; hue of 2.5Y, value of 5 or 6, and chroma of 2 to 4; or it is neutral (N) and has value of 5 or 6. It is sand or fine sand. In many pedons there are few to common, medium to large randomly scattered discontinuous pockets of loamy sand and fine sandy loam. Reaction ranges from extremely acid to strongly acid.

Wulfert series

The Wulfert series consists of very poorly drained, rapidly permeable soils that formed in moderately thick deposits of hydrophytic plant remains and sandy marine sediment. The soils are nearly level. They are in tidal mangrove swamps. Slopes are less than 1 percent. The soils are flooded daily by high tides. The water table is above the surface or just below the surface, depending on the tide. These soils are sandy or sandy-skeletal, siliceous, euic, hyperthermic Terric Sulfihemists.

Wulfert soils are near Kesson and Estero soils in mangrove swamps and Myakka and Bradenton soils on uplands. All the associated soils are mineral. Estero soils have a spodic horizon. Myakka soils are better drained than the Wulfert soils and have a spodic horizon. Bradenton soils are better drained and have an argillic horizon.

Typical pedon of Wulfert muck, in an area of Wulfert-Kesson association, in a mangrove swamp, on McGill Island, about 300 feet west of McGill cutoff and 100 feet south of Critical Bayou, sec. 4, T. 33 S., R. 17 E.

Oa1—0 to 2 inches; dark reddish brown (5YR 2/2) muck; about 55 percent mineral material; massive; friable; many fine and common medium roots; estimated 0.5 percent sulfur; slightly acid; clear smooth boundary.

Oa2—2 to 12 inches; dark reddish brown (5YR 3/2) muck; about 5 percent mineral material; massive; friable; common coarse roots; estimated 1.5 percent sulfur; strongly acid; clear smooth boundary.

Oa3—12 to 36 inches; dark brown (7.5YR 3/2) muck; about 70 percent mineral material; massive; friable; common fine and medium roots; estimated 2.0 percent sulfur; extremely acid; gradual wavy boundary.

IIC—36 to 60 inches; gray (5Y 5/1) fine sand; few medium, distinct light gray (5Y 7/1) streaks; single grained; loose; about 10 percent shell fragments; estimated 0.3 percent sulfur; extremely acid.

The content of sulfur ranges from 0.75 to 2.35 percent in the Oa2 and Oa3 horizons. The organic material in all horizons is dominantly sapric material, but in some pedons it is hemic material. Conductivity of the saturation extract above the IIC horizon ranges from about 200 to 400 mmho/cm. Reaction in the Oa horizon ranges from strongly acid to moderately alkaline in 0.01*M* CaCl2 in the natural state and from extremely acid to slightly acid after drying. Reaction in the IIC horizon ranges from strongly acid to mildly alkaline in field test and from extremely acid to medium acid after drying.

The Oa horizon has hue of 5YR, value of 2 or 3, and chroma of 1 or 2; hue of 10YR, value of 2, and chroma of 1; or hue of 7.5YR, value of 3, and chroma of 2. The content of mineral material ranges from about 40 to 80 percent. The horizon ranges from about 16 to 48 inches.

The IIC horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2. It is sand or fine sand and about 5 to 30 percent shell fragments.

Zolfo series

The Zolfo series consists of deep, somewhat poorly drained, moderately permeable soils that formed in thick deposits of sandy marine material. The soils are nearly level to gently sloping. They are on low to high ridges and knolls in the flatwoods and on slopes of ridges that border the larger streams and rivers. Slopes range from 0 to 5 percent. In most years, if the soils are not drained, the water table is at a depth of 24 to 40 inches for 2 to 6 months. In some years, it is at a depth of 10 to 24 inches for periods of less than 2 weeks. In most years, it is within a depth of 80 inches for 9 months or more. These soils are sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods.

Zolfo soils are near Cassia, Myakka, Orsino, Pomello, and Tavares soils. All the associated soils except Myakka soils are on landscapes similar to those of Zolfo soils. Cassia and Myakka soils have a spodic horizon within a depth of 30 inches. Myakka soils are at lower elevations and are poorly drained. Orsino, Pomello, and Tavares soils are better drained. Orsino and Tavares soils do not have a spodic horizon. Pomello soils have a spodic horizon at a depth between 30 and 50 inches.

Typical pedon of Zolfo fine sand, in a citrus grove, about 1.25 miles southeast of Parrish, NW1/4NE1/4 sec. 33, T. 33 S., R. 19 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) fine sand; single grained; loose; common fine and medium roots; slightly acid; clear smooth boundary.

A21—7 to 12 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine and medium roots; medium acid; clear smooth boundary.

A22—12 to 48 inches; pale brown (10YR 6/3) fine sand; common fine distinct yellow (10YR 7/6) mottles; single grained; loose; few fine and medium roots; strongly acid; gradual wavy boundary.

A23—48 to 65 inches; light gray (10YR 7/2) fine sand; common fine distinct strong brown (7.5YR 5/6) mottles; single grained; loose; strongly acid; clear wavy boundary.

B1h—65 to 72 inches; dark grayish brown (10YR 4/2) fine sand; weak fine granular structure; very friable; many uncoated sand grains; strongly acid; gradual wavy boundary.

B2h—72 to 80 inches; dark brown (7.5YR 3/2) fine sand; weak medium granular structure; friable; sand grains well coated with organic matter; strongly acid.

The solum is 80 inches or more thick. Reaction ranges from neutral to very strongly acid in the A horizon and slightly acid to extremely acid in the Bh horizon.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. It is 4 to 8 inches thick. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 to 4. There are few to common brown, yellow, or gray mottles. In some pedons there are white splotches within a depth of 40 inches.

The B1h horizon has hue of 10YR to 5YR, value of 3 or 4, and chroma of 2 or 3. It has few to common uncoated sand grains.

The B2h horizon has hue of 10YR to 5YR, value of 2 or 3, and chroma of 3 or less. It has few to common uncoated sand grains.

formation of the soils

In this section, the process of soil formation is described and related to the soils in Manatee County.

factors of soil formation

Soil is produced by forces of weathering acting on the parent material that has been deposited or accumulated by geologic agencies. The kind of soil that develops depends on five major factors. These factors are the climate under which soil material has existed since accumulation; the plant and animal life in and on the soil; the type of parent material; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material.

The five soil forming factors are interdependent; each modifies the effect of the others. Any one of the five factors can have more influence than the others on the formation of a soil and can account for most of its properties. For example, if the parent material is quartz sand, the soil generally has weakly expressed horizons. In some places, the effect of the parent material is modified greatly by the effects of climate, relief, and plants and animals in and on the soil. As a soil forms, it is influenced by more than one of five factors, but in some places one factor has a predominant effect. A modification or variation in any of these factors results in a different kind of soil.

parent material

Three geologic formations are at or near the surface in Manatee County: the Hawthorn Formation, the Bone Valley Formation, and Caloosahatchee marl (*4*). The Hawthorn Formation consists chiefly of gray phosphatic sand and lenses of green or gray fuller's earth. Known exposures of this formation are confined to the western part of the county. Farther to the east the Hawthorn Formation is overlain by the Bone Valley Formation and by late Pleistocene sand. A light-gray to white fuller's earth has been mined near Ellenton, although these pits are now abandoned. The fuller's earth varies in thickness from 7 feet to a thin film; in some places it does not occur (*8*). It is underlain by a compact, marly, fossiliferous limestone and overlain unconformably by a thin bed of Pleistocene terrace deposits.

The natural deposits of the Bone Valley Formation are rare; therefore, descriptions of it are based almost entirely on examinations of phosphate mines. The Bone Valley has been described as "gray, brown, or mottled sand and phosphate conglomerate in a sand matrix. The brown sands are locally cemented into a hard ferruginous sandstone, and slight induration is common (*7*)." According to the same source, the Bone Valley Gravel consists of rounded pebbles of phosphate embedded in a matrix of sand or clay overlain by loose semi-indurated sand of varying thickness. At the maximum this formation is probably more than 50 feet thick, but only about one-third of it is phosphate. It is estimated that more than half of Manatee County is underlain by pebble phosphate richer than 55 percent bone phosphate of lime.

The Caloosahatchee Marl consists mostly of sand and shells. In many places shells make up a large part of the deposits; in others they make up little or none. In fresh unweathered exposures of Caloosahatchee Marl, the shells are commonly white or light gray. After the exposures are subjected to the oxidizing effects of weathering, however, their color changes to cream or yellow. Only a few feet of this formation is exposed anywhere, because it occurs in a generally level region. In Manatee County this marl is in an area bordering the Gulf of Mexico.

Most of the soils in Florida have developed from a mantle of noncalcareous sands and clays overlying deposits of limestone. This mantle of sand and clay varies greatly in thickness in Manatee County. In the northeastern and central parts of the county it is comparatively thick, whereas in the southeastern and central parts it is so thin that the underlying limestone influences the characteristics of the soil. The Bradenton, Parkwood Variant, Manatee, and Felda soils were derived from or influenced by the underlying marl.

climate

The subtropical climate of Manatee County, characterized by high relative humidity, short mild winters, long warm summers, and abundant rainfall, affects the development of the soils. The heavy rains on the higher well-drained sandy areas percolate rapidly through the soil and transfer materials from one horizon to another or out of the soil completely.

Climate exerts its influence on soils directly and indirectly. Directly, it affects the type of weathering of the parent material; the collection and deposition of materials transported by water, wind, and gravity; and

the percolation of water through the soil. Indirectly, it is responsible for the variation in the biologic forces, for the shaping of land masses thrust up from the sea by movements of the earth's crust, and, to a certain extent, for the character of many rock formations (*3*).

Climate and relief, including drainage, influence plant and animal life, which in turn influence the development of the soil profile.

plants and animals

Plants have been the principal biological factor in the formation of soils in the survey area. Animals, insects, bacteria, and fungi have also been important factors. Plant and animal life furnish organic matter to the soil and bring plant nutrients from the lower layers to the upper layers of the soil. In places, plants and animals are the cause of differences in the amount of organic matter, nitrogen, and plant nutrients in the soil and differences in soil structure and porosity. For example, roots of trees and crayfish have penetrated loamy subsoil and mixed sandy surface layers with the subsoil.

Micro-organisms, including bacteria and fungi, help to weather and break down minerals and to decompose organic matter. These organisms are most numerous in the upper few inches of the soil. Earthworms and other small animals inhabit the soil, alter its chemical composition, and mix it with other soil material. However, the native vegetation in the survey area has affected soil formation more than other living organisms.

Man has influenced the formation of soils by clearing the forests, cultivating the soils, draining wet areas, and introducing different kinds of plants.

relief

Relief has affected the formation of soils in Manatee County mainly through its influence on soil and water relationships. Other factors of soil formation generally associated with relief, for example, erosion, temperature, and plant cover, are of minor importance.

The survey area is made up of flatwoods, swamps and marshes, and coastal ridge. Differences among the soils in these areas are directly related to relief.

The soils in the flatwoods have a high water table and are periodically wet to the surface. Therefore, they are not so highly leached as those soils on the ridge. The soils in the swamps and marshes are covered with water for long periods of time. In many places they have high organic matter content. The soils in the coastal ridge are at a higher elevation than the soils in the flatwoods and swamps and marshes. Because most of these deep sandy soils are excessively drained, they are not influenced by ground water. However, they are more subject to erosion than soils in other parts of the county.

time

Time is an important factor in soil formation. The physical and chemical changes brought about by climate, living organisms, and relief are slow. The length of time needed to convert raw geological material into soil varies according to the nature of the geologic material and the interaction of the other factors. Some basic minerals from which soils are formed weather fairly rapidly; other minerals are chemically inert and show little change over long periods of time. The translocation of fine particles within the soil to form horizons is variable under different conditions, but the processes always take a relatively long period of time.

In Manatee County, the dominant geological material is inactive. The sands are almost pure quartz and are highly resistant to weathering. The finer textured silts and clays are the product of earlier weathering.

In terms of geological time, relatively little time has elapsed since the parent material of the soils was laid down or emerged from the sea. The loamy and clayey horizons formed in place through processes of clay translocation.

processes of soil formation

Soil morphology refers to the process of the formation of soil horizons or of soil horizon differentiation. The differentiation of horizons in soils in Manatee County is the result of accumulation of organic matter, leaching of carbonates, reduction and transfer of iron, or accumulation of silicate clay minerals. Sometimes more than one of these processes is involved.

Some organic matter has accumulated in the upper layers of most of the soils to form an A1 horizon. The quantity of organic matter is small in some of the soils and fairly large in others.

Carbonates and salts have been leached in all the soils. Because the leaching permitted the subsequent translocation of silicate clay material in some soils, the effects of leaching have been indirect. Most of the soils of the survey area are leached to varying degrees.

Except in the excessively drained soils, the process of chemical reduction, or gleying, is evident in many of the soils in Manatee County. Gleying is caused by wetness. The gray matrix in the B horizon in many soils and grayish mottles in some other soils indicate the reduction of iron. In some sandy soils, however, the sand grains are gray. In some horizons, reddish brown mottles and concretions indicate the segregation of iron and a fluctuating water table.

The translocation of silicate clay, colloidal organic matter, and iron oxides has contributed to horizon development in many of the soils in the survey area. Movement of clay, organic matter, or iron is evident in many of the soils; for example, in a light colored, leached A2 horizon; in a Bt or Bh horizon in which sand

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grains are bridged and coated with clay or colloidal organic matter; or in a few patchy clay films on ped faces and in root channels. Other processes involved in soil formation, however, are less important in the formation of horizons in the soils of Manatee County than the translocation of silicate clays.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water

is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a

combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical

distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

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tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded at Bradenton, Florida. Elevation, 10 feet]

Month	Temperature[1]			Precipitation[2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1944)	Wettest year (1912)	Average snowfall
	°F	°F	°F	In	In	In	In
December	62.6	86	19	2.35	0.47	1.21	0
January	61.5	88	20	2.63	1.69	5.98	0
February	62.5	89	21	2.78	.27	1.95	([3])
Winter	62.2	89	19	7.76	2.43	9.14	([3])
March	66.2	91	30	2.34	4.83	1.86	0
April	70.7	93	37	2.31	1.90	1.13	0
May	75.6	97	45	3.06	2.30	3.84	0
Spring	70.8	97	30	7.71	9.03	6.83	0
June	79.8	100	55	6.90	3.10	25.62	0
July	80.8	99	61	9.73	5.75	9.03	0
August	81.2	98	62	9.58	3.09	6.45	0
Summer	80.6	100	55	26.21	11.94	41.10	0
September	80.0	98	56	7.64	2.37	16.65	0
October	74.5	96	39	3.39	3.38	5.61	0
November	67.2	90	27	1.89	.30	2.10	0
Fall	73.9	98	27	12.92	6.05	24.36	0
Year	71.8	100	19	54.60	29.45	81.43	0

[1]Average temperature based on a 72-year record, through 1955; highest temperature based on a 61-year record and lowest on a 60-year record, through 1955.

[2]Average precipitation based on a 72-year record, through 1955; wettest and driest years based on a 72-year record, in the period 1869-1955; snowfall, based on a 22-year record, through 1952.

[3]Trace.

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Adamsville Variant fine sand	1,132	0.2
2	Beaches	959	0.2
3	Braden fine sand	945	0.2
4	Bradenton fine sand	2,097	0.4
5	Bradenton fine sand, limestone substratum	5,121	1.0
6	Broward Variant fine sand	1,244	0.2
7	Canova, Anclote, and Okeelanta soils	8,630	1.7
8	Canaveral fine sand, 0 to 5 percent slopes	480	0.1
9	Canaveral sand, filled	1,280	0.3
10	Canaveral sand, organic substratum	500	0.1
11	Cassia fine sand	17,773	3.5
12	Cassia fine sand, moderately well drained	3,215	0.6
13	Chobee loamy fine sand	2,582	0.5
14	Chobee Variant sandy clay loam	381	0.1
15	Delray mucky loamy fine sand	305	0.1
16	Delray complex	3,129	0.6
17	Delray-EauGallie complex	20,483	4.1
18	Delray-Pomona complex	3,009	0.6
19	Duette fine sand, 0 to 5 percent slopes	9,191	1.8
20	EauGallie fine sand	112,454	22.4
21	Estero muck	6,894	1.4
22	Felda fine sand	1,977	0.4
23	Felda-Palmetto complex	2,260	0.5
24	Felda-Wabasso association, frequently flooded	13,130	2.6
25	Floridana fine sand	3,555	0.7
26	Floridana-Immokalee-Okeelanta association	23,497	4.7
27	Gator muck	123	*
28	Hallandale fine sand	303	0.1
29	Manatee mucky loamy fine sand	595	0.1
30	Myakka fine sand, 0 to 2 percent slopes	77,973	15.5
31	Myakka fine sand, 2 to 5 percent slopes	1,835	0.4
32	Myakka fine sand, shell substratum	959	0.2
33	Myakka fine sand, tidal	451	0.1
34	Okeelanta muck, tidal	1,817	0.4
35	Ona fine sand, ortstein substratum	6,337	1.3
36	Orlando fine sand, moderately wet, 0 to 2 percent slopes	554	0.1
37	Orsino fine sand, 0 to 5 percent slopes	481	0.1
38	Palmetto sand	5,905	1.2
39	Parkwood Variant complex	1,714	0.3
40	Pinellas fine sand	480	0.1
41	Pits and Dumps	470	0.1
42	Pomello fine sand, 0 to 2 percent slopes	23,420	4.7
43	St. Johns fine sand, 2 to 5 percent slopes	5,029	1.0
44	St. Johns-Myakka complex	3,060	0.6
45	Tavares fine sand, 0 to 5 percent slopes	3,018	0.6
46	Tavares fine sand, cemented substratum, 2 to 5 percent slopes	433	0.1
47	Tomoka muck	7,185	1.4
48	Wabasso fine sand	9,717	1.9
49	Wabasso fine sand, rarely flooded	6,898	1.4
50	Wabasso Variant fine sand	1,888	0.4
51	Wauchula fine sand	287	0.1
52	Waveland fine sand	56,514	11.2
53	Wulfert-Kesson association	3,028	0.6
54	Zolfo fine sand, 0 to 2 percent slopes	2,335	0.5
55	Zolfo fine sand, 2 to 5 percent slopes	168	*
	Fresh water	7,459	1.5
	Brackish water	25,341	5.0
	Total	502,000	100.0

* Less than 0.1 percent.

TABLE 3.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Oranges	Grapefruit	Tomatoes	Watermelons	Cabbage	Pasture	Grass-clover
	Box	Box	Ton	Ton	Crate	AUM*	AUM*
1------------------------- Adamsville Variant	375	500	8	---	400	7.0	11.0
2. Beaches							
3------------------------- Braden	375	500	7	---	---	---	---
4------------------------- Bradenton	450	550	---	---	---	9.0	12.0
5------------------------- Bradenton	450	550	---	---	---	---	12.0
6------------------------- Broward Variant	350	450	13	---	300	---	12.0
7------------------------- Canova, Anclote, and Okeelanta	---	---	---	---	397	---	---
8, 9---------------------- Canaveral	---	---	---	---	---	---	---
10------------------------ Canaveral	---	---	---	---	---	---	---
11, 12-------------------- Cassia	250	350	---	10	---	6.0	---
13------------------------ Chobee	425	500	6	---	300	12.0	15.0
14------------------------ Chobee Variant	---	---	---	---	---	---	12.0
15, 16-------------------- Delray	---	---	6	---	300	10.0	12.0
17------------------------ Delray-EauGallie	---	---	7	---	283	---	12.2
18------------------------ Delray-Pomona	---	---	7	---	309	---	11.0
19------------------------ Duette	---	---	---	---	---	---	---
20------------------------ EauGallie	375	575	8	---	250	8.0	12.0
21------------------------ Estero	---	---	---	---	---	---	---
22------------------------ Felda	425	625	8	---	250	7.5	10.5
23------------------------ Felda-Palmetto	401	543	10	---	321	---	11.2

See footnote at end of table.

TABLE 3.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Oranges	Grapefruit	Tomatoes	Watermelons	Cabbage	Pasture	Grass-clover
	Box	Box	Ton	Ton	Crate	AUM*	AUM*
24:							
Felda	---	---	---	---	---	---	10.0
Wabasso	---	---	---	---	---	---	12.0
25 Floridana	---	---	14	---	---	10.0	13.0
26:							
Floridana	---	---	---	---	---	---	---
Immokalee	---	---	---	---	---	---	---
Okeelanta	---	---	---	---	350	15.0	---
27 Gator	---	---	---	---	---	---	---
28 Hallandale	375	500	16	---	300	5.5	---
29 Manatee	425	500	8	---	480	12.0	14.0
30, 31 Myakka	350	550	15	12	320	9.0	12.0
32 Myakka	350	550	---	---	---	---	---
33 Myakka	---	---	---	---	---	---	---
34 Okeelanta	---	---	---	---	---	---	---
35 Ona	350	550	12	---	300	---	12.0
36 Orlando	500	700	---	---	---	---	---
37 Orsino	350	450	---	---	---	5.0	---
38 Palmetto	375	450	13	---	400	---	12.0
39 Parkwood Variant	450	650	8	---	375	9.0	12.0
40 Pinellas	425	575	7	---	250	8.0	12.0
41. Pits and Dumps							
42 Pomello	250	400	---	10	---	3.5	---
43 St. Johns	300	550	12	---	300	---	12.0
44 St. Johns-Myakka	324	551	13	---	309	---	---

See footnote at end of table.

TABLE 3.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Oranges	Grapefruit	Tomatoes	Watermelons	Cabbage	Pasture	Grass-clover
	Box	Box	Ton	Ton	Crate	AUM*	AUM*
45, 46-------------------- Tavares	425	600	---	8	---	8.0	---
47------------------------ Tomoka	---	---	---	---	280	---	32.0
48------------------------ Wabasso	400	575	13	---	250	8.0	12.0
49------------------------ Wabasso	400	575	13	---	250	---	12.0
50------------------------ Wabasso Variant	400	575	13	---	250	---	12.0
51------------------------ Wauchula	400	575	13	---	250	10.0	12.0
52------------------------ Waveland	325	400	15	---	310	8.0	12.0
53:							
Wulfert------------------	---	---	---	---	---	---	---
Kesson-------------------	---	---	---	---	---	---	---
54, 55-------------------- Zolfo	375	500	7	---	400	---	10.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 4.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	---	---	---	---	---
II	---	---	---	---	---
III	99,565	---	94,615	4,950	---
IV	268,660	---	268,179	481	---
V	13,129	---	13,129	---	---
VI	56,240	---	881	55,359	---
VII	17,979	---	17,979	---	---
VIII	12,189	---	12,189	---	---

TABLE 5.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Map symbol and soil name	Range site	Potential annual production for kind of growing season (dry weight)		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
1------------------ Adamville Variant	South Florida Flatwoods	6,000	4,500	3,000
3------------------ Braden	South Florida Flatwoods	6,000	4,500	3,000
4------------------ Bradenton	Cabbage Palm Hammock	4,000	3,000	2,000
5------------------ Bradenton	Cabbage Palm Hammock	4,000	3,000	2,000
6------------------ Broward Variant	South Florida Flatwoods	6,000	4,500	3,000
11----------------- Cassia	Sand Pine Scrub	3,500	2,000	1,500
12----------------- Cassia	Sand Pine Scrub	3,500	2,000	1,500
15----------------- Delray	Freshwater Marsh and Ponds	10,000	8,000	5,000
16----------------- Delray	Slough	8,000	6,000	4,000
17----------------- Delray-EauGallie	Slough and South Florida Flatwoods	7,200	5,300	3,600
18----------------- Delray-Pomona	Slough and South Florida Flatwoods	7,200	5,300	3,600
19----------------- Duette	Sand Pine Scrub	3,500	2,000	1,500
20----------------- EauGallie	South Florida Flatwoods	6,000	4,500	3,000
22----------------- Felda	Slough	8,000	6,000	4,000
23----------------- Felda-Palmetto	Oak Hammock	3,500	3,000	2,500
25----------------- Floridana	Freshwater Marsh and Ponds	10,000	8,000	5,000
26----------------- Floridana-Immokalee-Okeelanta	Freshwater Marsh and Ponds	10,000	8,000	5,000
27----------------- Gator	Freshwater Marsh and Ponds	10,000	8,000	5,000
28----------------- Hallandale	Cabbage Palm Flatwoods	9,000	7,000	4,500
29----------------- Manatee	Freshwater Marsh and Ponds	10,000	8,000	5,000
30----------------- Myakka	South Florida Flatwoods	6,000	4,500	3,000
31----------------- Myakka	South Florida Flatwoods	6,000	4,500	3,000

TABLE 5.--RANGELAND PRODUCTIVITY--Continued

Map symbol and soil name	Range site	Potential annual production for kind of growing season (dry weight)		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
34: Okeelanta	Salt Marsh	8,000	6,000	4,000
35: Ona	South Florida Flatwoods	6,000	4,500	3,000
36: Orlando	Longleaf Pine-Turkey Oak Hills	4,000	3,000	2,000
37: Orsino	Sand Pine Scrub	3,500	2,000	1,500
38: Palmetto	Slough	8,000	6,000	4,000
39: Parkwood Variant	Cabbage Palm Hammock	4,000	3,000	2,000
40: Pinellas	Cabbage Palm Flatwoods	9,000	7,000	4,500
42: Pomello	Sand Pine Scrub	3,500	2,000	1,500
43: St. Johns	South Florida Flatwoods	6,000	4,500	3,000
44: St. Johns-Myakka	South Florida Flatwoods	6,000	4,500	3,000
45: Tavares	Longleaf Pine-Turkey Oak Hills	4,000	3,000	2,000
46: Tavares	Longleaf Pine-Turkey Oak Hills	4,000	3,000	2,000
47: Tomoka	Freshwater Marsh and Ponds	10,000	8,000	5,000
48: Wabasso	South Florida Flatwoods	6,000	4,500	3,000
49: Wabasso	South Florida Flatwoods	6,000	4,500	3,000
50: Wabasso Variant	South Florida Flatwoods	6,000	4,500	3,000
51: Wauchula	South Florida Flatwoods	6,000	4,500	3,000
52: Waveland	South Florida Flatwoods	6,000	4,500	3,000
54: Zolfo	South Florida Flatwoods	6,000	4,500	3,000
55: Zolfo	South Florida Flatwoods	6,000	4,500	3,000

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available. The site index for South Florida slash pine is a 25-year index, and the site index for all other species is a 50-year index]

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
1 Adamsville Variant	3w	Slight	Moderate	Moderate	Moderate	Slash pine	80	Slash pine, South Florida slash pine.
						Longleaf pine	65	
						South Florida slash pine	45	
3 Braden	3s	Slight	Slight	Moderate	Slight	Slash pine	80	South Florida slash pine.
						Longleaf pine	65	
						South Florida slash pine	45	
4 Bradenton	2w	Slight	Moderate	Moderate	Moderate	Slash pine	90	Slash pine, South Florida slash pine.
						Longleaf pine	75	
						South Florida slash pine	55	
5 Bradenton	2w	Slight	Moderate	Moderate	Moderate	Slash pine	90	Slash pine, South Florida slash pine.
						Longleaf pine	75	
						South Florida slash pine	55	
6 Broward Variant	4w	Slight	Moderate	Moderate	Moderate	Slash pine	70	Slash pine, South Florida slash pine.
						South Florida slash pine	35	
7:								
Canova	2w	Slight	Severe[3]	Severe[3]	Moderate	Slash pine[1]	90	Slash pine,[2] South Florida slash pine.[2]
						Longleaf pine[1]	75	
						South Florida slash pine[1]	55	
Anclote	2w	Slight	Severe[3]	Severe[3]	Moderate	Slash pine[1]	90	Slash pine, sweetgum, South Florida slash pine.
						Longleaf pine[1]	75	
						Sweetgum	90	
						South Florida slash pine[1]	55	
Okeelanta	3w	Slight	Severe[3]	Severe[3]	Moderate	Slash pine[1]	80	Slash pine,[2] South Florida slash pine.[2]
						Longleaf pine[1]	65	
						Pond pine	65	
8, 9 Canaveral	4s	Slight	Severe	Severe	Moderate	Sand pine	70	Slash pine, South Florida slash pine, sand pine.
						Slash pine	70	
						South Florida slash pine	35	
11 Cassia	4s	Slight	Moderate	Severe	Moderate	Slash pine	60	Sand pine.
						Longleaf pine	60	
						Sand pine	70	
						South Florida slash pine	35	
12 Cassia	4s	Slight	Moderate	Severe	Moderate	Slash pine	60	Sand pine.
						Longleaf pine	60	
						Sand pine	70	
						South Florida slash pine	35	
13 Chobee	2w	Slight	Severe[3]	Severe[3]	Severe	Slash pine[1]	90	Slash pine,[2] South Florida slash pine.[2]
						Longleaf pine[1]	70	
						South Florida slash pine[1]	55	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
14 Chobee Variant	2w	Slight	Severe[3]	Severe[3]	Moderate	Slash pine[1] South Florida slash pine[1]	90 55	Slash pine,[2] South Florida slash pine.[2]
15, 16 Delray	2w	Slight	Severe[3]	Severe[3]	Moderate	Slash pine[1] Longleaf pine[1] Sweetgum South Florida slash pine[1]	90 70 90 55	Slash pine,[2] sweetgum, South Florida slash pine.[2]
17: Delray	2w	Slight	Severe[3]	Severe[3]	Moderate	Slash pine[1] Longleaf pine[1] Sweetgum South Florida slash pine[1]	90 70 90 55	Slash pine,[2] sweetgum, South Florida slash pine.[2]
EauGallie	3w	Slight	Moderate	Moderate	Moderate	Slash pine Longleaf pine South Florida slash pine	80 70 45	Slash pine, South Florida slash pine.
18: Delray	2w	Slight	Severe	Severe	Moderate	Slash pine[1] Longleaf pine[1] Sweetgum South Florida slash pine[1]	90 70 90 55	Slash pine,[2] sweetgum, South Florida slash pine.[2]
Pomona	3w	Slight	Moderate	Moderate	Moderate	Slash pine Loblolly pine Longleaf pine South Florida slash pine	80 80 70 45	Slash pine, South Florida slash pine.
19 Duette	5s	Slight	Moderate	Severe	Slight	Slash pine Sand pine Sand live oak South Florida slash pine	55 45 --- 25	Slash pine, sand pine, South Florida slash pine.
20 EauGallie	3w	Slight	Moderate	Moderate	Moderate	Slash pine Longleaf pine South Florida slash pine	80 70 45	Slash pine, South Florida slash pine.
22 Felda	3w	Slight	Moderate	Severe	Moderate	Slash pine Longleaf pine South Florida slash pine	80 65 45	Slash pine, South Florida slash pine.
23: Felda	3w	Slight	Moderate	Severe	Moderate	Slash pine Longleaf pine South Florida slash pine	80 65 45	Slash pine, South Florida slash pine.
Palmetto	3w	Slight	Severe[3]	Severe[3]	Severe	Slash pine[1] Longleaf pine[1] South Florida slash pine[1]	80 65 45	Slash pine,[2] South Florida slash pine.[2]
24: Felda	3w	Slight	Moderate	Severe	Moderate	Slash pine Longleaf pine South Florida slash pine	80 65 45	Slash pine, South Florida slash pine.

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
24:								
Wabasso	3w	Slight	Moderate	Moderate	Moderate	Slash pine South Florida slash pine	80 45	South Florida slash pine, slash pine.
25 Floridana	3w	Slight	Severe[3]	Severe[3]	Moderate	Slash pine[1] Longleaf pine[1] South Florida slash pine[1]	80 65 45	Slash pine,[2] South Florida slash pine.
26:								
Floridana	3w	Slight	Severe[3]	Severe[3]	Moderate	Pond pine	65	Pond pine, South Florida slash pine.[2]
Immokalee	4w	Slight	Severe[3]	Severe[3]	Severe	Pond pine	55	Pond pine, South Florida slash pine.[2]
Okeelanta	3w	Slight	Severe[3]	Severe[3]	Moderate	Pond pine	65	Pond pine, South Florida slash pine.[2]
27 Gator	4w	Slight	Severe[3]	Severe[3]	Severe	Sweetgum Red maple Pond pine Baldcypress	20 --- 25 ---	Sweetgum, slash pine,[2] pond pine, South Florida slash pine.[2]
28 Hallandale	4w	Slight	Moderate	Moderate	Moderate	South Florida slash pine	35	South Florida slash pine.
29 Manatee	2w	Slight	Severe[3]	Severe[3]	Moderate	Slash pine[1] Longleaf pine[1] South Florida slash pine[1]	90 75 55	Slash pine,[2] South Florida slash pine.[2]
30, 31 Myakka	4w	Slight	Moderate	Moderate	Moderate	Slash pine Longleaf pine South Florida slash pine	70 60 35	Slash pine, South Florida slash pine.
32 Myakka	4w	Slight	Moderate	Moderate	Moderate	Slash pine South Florida slash pine	70 35	South Florida slash pine, slash pine.
35 Ona	3w	Slight	Moderate	Moderate	Moderate	Slash pine Longleaf pine South Florida slash pine	80 70 45	Slash pine, South Florida slash pine.
36 Orlando	3s	Slight	Moderate	Moderate	Moderate	Slash pine Longleaf pine South Florida slash pine	80 65 45	Slash pine, South Florida slash pine.
37 Orsino	4s	Slight	Moderate	Severe	Moderate	Slash pine Longleaf pine Sand pine South Florida slash pine	70 60 70 35	Slash pine, sand pine, South Florida slash pine.
38 Palmetto	3w	Slight	Severe[3]	Severe[3]	Severe	Slash pine[1] Longleaf pine[1] South Florida slash pine[1]	80 70 40	South Florida slash pine,[2] slash pine.[2]
39 Parkwood Variant	3w	Slight	Moderate	Moderate	Moderate	Slash pine Longleaf pine South Florida slash pine	80 65 45	Slash pine, South Florida slash pine.

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
40----------------- Pinellas	4w	Slight	Moderate	Moderate	Moderate	South Florida slash pine--------------- Longleaf pine-------	 35 60	South Florida slash pine.
42----------------- Pomello	4s	Slight	Moderate	Severe	Moderate	Slash pine---------- Longleaf pine------- Sand pine----------- South Florida slash pine---------------	60 60 70 35	Sand pine.
43----------------- St. Johns	3w	Slight	Moderate	Moderate	Moderate	Slash pine---------- Longleaf pine------- South Florida slash pine---------------	80 70 45	Slash pine, South Florida slash pine.
44:								
St. Johns---------	3w	Slight	Moderate	Moderate	Moderate	Slash pine---------- Longleaf pine------- South Florida slash pine---------------	80 70 45	Slash pine, South Florida slash pine.
Myakka------------	4w	Slight	Moderate	Moderate	Moderate	Slash pine---------- Longleaf pine------- South Florida slash pine---------------	70 60 35	Slash pine, South Florida slash pine.
45----------------- Tavares	3s	Slight	Moderate	Moderate	Moderate	Slash pine---------- Longleaf pine------- South Florida slash pine---------------	80 70 45	Slash pine, South Florida slash pine.
46----------------- Tavares	3s	Slight	Moderate	Moderate	Moderate	Slash pine---------- Longleaf pine------- South Florida slash pine---------------	80 70 45	Slash pine, South Florida slash pine.
47----------------- Tomoka	4w	Slight	Severe[3]	Severe[3]	Severe	Sweetgum------------ Sweetbay------------ Red maple----------- Pond pine-----------	70 --- --- 55	Slash pine,[2] South Florida slash pine,[2] pond pine.
49----------------- Wabasso	3w	Slight	Moderate	Moderate	Moderate	Slash pine---------- South Florida slash pine---------------	80 45	South Florida slash pine, slash pine.
50----------------- Wabasso Variant	3w	Slight	Moderate	Moderate	Moderate	Slash pine---------- South Florida slash pine---------------	80 45	Slash pine, South Florida slash pine.
51----------------- Wauchula	3w	Slight	Moderate	Moderate	Moderate	Slash pine---------- Longleaf pine------- South Florida slash pine---------------	80 65 45	Slash pine, South Florida slash pine.
52----------------- Waveland	4w	Slight	Moderate	Moderate	Moderate	Slash pine---------- South Florida slash pine--------------- Longleaf pine-------	70 35 60	Slash pine, South Florida slash pine.
54, 55------------- Zolfo	3w	Slight	Moderate	Moderate	Moderate	Slash pine---------- Longleaf pine------- South Florida slash pine---------------	80 65 45	Slash pine, South Florida slash pine.

1 Potential productivity attainable only in areas where surface drainage is adequate.
2 Tree planting is feasible only in areas where surface drainage is adequate.
3 Equipment limitation and seedling mortality are moderate where surface drainage is adequate.

TABLE 7.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1. Adamsville Variant	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
2. Beaches					
3. Braden	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
4, 5. Bradenton	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
6. Broward Variant	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
7:					
Canova	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Anclote	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness.
Okeelanta	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
8, 9. Canaveral	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Severe: droughty.
10. Canaveral	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
11. Cassia	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: wetness, droughty.
12. Cassia	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
13. Chobee	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
14. Chobee Variant	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
15. Delray	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
16. Delray	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.
17:					
Delray	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
17:					
EauGallie	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, droughty.
18:					
Delray	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.
Pomona	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
19 Duette	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
20 EauGallie	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, droughty.
21 Estero	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus, excess salt.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.	Severe: excess salt, wetness, flooding.
22 Felda	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
23:					
Felda	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Palmetto	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
24:					
Felda	Severe: flooding, wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness, flooding.	Severe: wetness, too sandy.	Severe: wetness, droughty, flooding.
Wabasso	Severe: flooding, wetness, too sandy.	Severe: wetness, too sandy, percs slowly.	Severe: too sandy, wetness, flooding.	Severe: wetness, too sandy.	Severe: wetness, flooding.
25 Floridana	Severe: wetness, percs slowly, too sandy.	Severe: wetness, too sandy, percs slowly.	Severe: too sandy, wetness, percs slowly.	Severe: wetness, too sandy.	Severe: wetness.
26:					
Floridana	Severe: ponding, percs slowly, too sandy.	Severe: ponding, too sandy, percs slowly.	Severe: too sandy, wetness, percs slowly.	Severe: ponding, too sandy.	Severe: ponding.
Immokalee	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding.
Okeelanta	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
27 Gator	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus, excess salt.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: excess salt, ponding, flooding.
28 Hallandale	Severe: wetness, too sandy, depth to rock.	Severe: wetness, too sandy, depth to rock.	Severe: too sandy, wetness, depth to rock.	Severe: wetness, too sandy.	Severe: wetness, droughty, thin layer.
29 Manatee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
30, 31, 32 Myakka	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
33 Myakka	Severe: flooding, wetness, too sandy.	Severe: flooding, wetness, too sandy.	Severe: too sandy, wetness, flooding.	Severe: flooding, wetness, too sandy.	Severe: excess salt, wetness, flooding.
34 Okeelanta	Severe: flooding, wetness, excess humus.	Severe: flooding, wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus, flooding.	Severe: excess salt, wetness, flooding.
35 Ona	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
36 Orlando	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
37 Orsino	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
38 Palmetto	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
39 Parkwood Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
40 Pinellas	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
41. Pits and Dumps					
42 Pomello	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
43 St. Johns	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness.
44:					
St. Johns	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness.
Myakka	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
45, 46 Tavares	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
47 Tomoka	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
48 Wabasso	Severe: wetness, percs slowly, too sandy.	Severe: wetness, too sandy, percs slowly.	Severe: too sandy, wetness, percs slowly.	Severe: wetness, too sandy.	Severe: wetness.
49 Wabasso	Severe: flooding, wetness, too sandy.	Severe: wetness, too sandy, percs slowly.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, flooding.
50 Wabasso Variant	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
51 Wauchula	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: wetness.
52 Waveland	Severe: wetness, too sandy, percs slowly.	Severe: wetness, too sandy, percs slowly.	Severe: too sandy, wetness, percs slowly.	Severe: wetness, too sandy.	Severe: wetness, droughty.
53:					
Wulfert	Severe: wetness, excess humus, excess salt.	Severe: flooding, wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.	Severe: excess salt, excess sulfur, wetness.
Kesson	Severe: flooding, wetness, too sandy.	Severe: flooding, wetness, too sandy.	Severe: too sandy, wetness, flooding.	Severe: wetness, too sandy, flooding.	Severe: excess salt, excess sulfur, wetness.
54, 55 Zolfo	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.

TABLE 8.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1. Adamsville Variant	Poor	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
2. Beaches										
3. Braden	Fair	Good	Good	Fair	Fair	Poor	Poor	Good	Fair	Poor.
4. Bradenton	Poor	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Poor.
5. Bradenton	Poor	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
6. Broward Variant	Poor	Poor	Poor	Poor	Poor	Fair	Poor	Poor	Poor	Poor.
7:										
Canova	Poor	Fair	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
Anclote	Very poor.	Poor	Poor	Fair	Poor	Good	Good	Poor	Fair	Good.
Okeelanta	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
8, 9. Canaveral	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
10. Canaveral	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
11. Cassia	Very poor.	Poor	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.
12. Cassia	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
13. Chobee	Poor	Poor	Poor	Fair	Poor	Good	Good	Poor	Poor	Good.
14. Chobee Variant	Very poor.	Poor	Fair	Fair	Poor	Good	Good	Poor	Fair	Good.
15, 16. Delray	Poor	Poor	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
17:										
Delray	Poor	Poor	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
EauGallie	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
18:										
Delray	Poor	Poor	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
Pomona	Poor	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair	Fair.
19. Duette	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

TABLE 8.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
20 EauGallie	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
21 Estero	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Good	Very poor.	Very poor.	Fair.
22 Felda	Poor	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Poor	Fair.
23:										
Felda	Poor	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Poor	Fair.
Palmetto	Poor	Poor	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
24:										
Felda	Poor	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Poor	Fair.
Wabasso	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair	Poor.
25 Floridana	Poor	Poor	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
26:										
Floridana	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Immokalee	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Good	Very poor.	Very poor.	Fair.
Okeelanta	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
27 Gator	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Good	Good	Very poor.	Very poor.	Good.
28 Hallandale	Poor	Poor	Poor	Poor	Poor	Fair	Good	Poor	Poor	Fair.
29 Manatee	Poor	Poor	Fair	Poor	Fair	Good	Good	Poor	Poor	Good.
30, 31, 32 Myakka	Poor	Fair	Good	Poor	Fair	Fair	Poor	Fair	Fair	Poor.
33 Myakka	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Fair.
34 Okeelanta	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Good	Very poor.	Very poor.	Good.
35 Ona	Poor	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair	Fair.
36 Orlando	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
37 Orsino	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
38 Palmetto	Poor	Poor	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
39 Parkwood Variant	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.

TABLE 8.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
40: Pinellas	Very poor.	Poor	Poor	Poor	Poor	Fair	Fair	Poor	Poor	Fair.
41. Pits and Dumps										
42: Pomello	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
43: St. Johns	Poor	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair	Fair.
44:										
St. Johns	Poor	Fair	Fair	Poor	Fair	Fair	Fair	Fair	Fair	Fair.
Myakka	Poor	Fair	Good	Poor	Fair	Fair	Poor	Fair	Fair	Poor.
45, 46: Tavares	Poor	Fair	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
47: Tomoka	Very poor.	Poor	Poor	Fair	Poor	Good	Good	Poor	Poor	Good.
48, 49: Wabasso	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair	Poor.
50: Wabasso Variant	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair	Poor.
51: Wauchula	Poor	Poor	Poor	Poor	Poor	Poor	Very poor.	Poor	Poor	Poor.
52: Waveland	Poor	Fair	Fair	Poor	Fair	Fair	Poor	Fair	Fair	Poor.
53:										
Wulfert	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Fair.
Kesson	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Fair.
54, 55: Zolfo	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1----------------- Adamsville Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
2.* Beaches						
3----------------- Braden	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
4----------------- Bradenton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
5----------------- Bradenton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
6----------------- Broward Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
7:*						
Canova------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
Anclote-----------	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Okeelanta---------	Severe: cutbanks cave, excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, excess humus.
8, 9-------------- Canaveral	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: droughty.
10---------------- Canaveral	Severe: cutbanks cave, excess humus.	Moderate: low strength.	Moderate: wetness.	Moderate: low strength.	Moderate: low strength.	Severe: droughty.
11---------------- Cassia	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
12---------------- Cassia	Severe: cutbanks cave.	Slight----------	Moderate: wetness.	Slight----------	Slight----------	Severe: droughty.
13---------------- Chobee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
14---------------- Chobee Variant	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding.
15, 16*----------- Delray	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
17:*						
Delray------------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
17:*						
EauGallie----------	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
18:*						
Delray-------------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Pomona-------------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
19----------------- Duette	Severe: cutbanks cave.	Slight-----------	Moderate: wetness.	Slight-----------	Slight-----------	Severe: droughty.
20----------------- EauGallie	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
21----------------- Estero	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: excess salt, wetness, flooding.
22----------------- Felda	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
23:*						
Felda--------------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Palmetto-----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
24:*						
Felda--------------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, droughty, flooding.
Wabasso------------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
25----------------- Floridana	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
26:*						
Floridana----------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Immokalee----------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Okeelanta----------	Severe: cutbanks cave, excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
27 Gator	Severe: cutbanks cave, excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding, flooding.	Severe: excess salt, ponding, flooding.
28 Hallandale	Severe: depth to rock, wetness.	Severe: wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty, thin layer.
29 Manatee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
30, 31, 32 Myakka	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
33 Myakka	Severe: cutbanks cave, wetness, flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: excess salt, wetness, flooding.
34 Okeelanta	Severe: cutbanks cave, excess humus, wetness.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness.	Severe: flooding, wetness, low strength.	Severe: low strength, wetness, flooding.	Severe: excess salt, wetness, flooding.
35 Ona	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
36 Orlando	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: droughty.
37 Orsino	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: droughty.
38 Palmetto	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
39* Parkwood Variant	Severe: wetness.	Severe: wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Severe: wetness.	Severe: wetness.
40 Pinellas	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
41.* Pits and Dumps						
42 Pomello	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
43 St. Johns	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
44:*						
St. Johns	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Myakka	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
45, 46 Tavares	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: droughty.
47 Tomoka	Severe: cutbanks cave, excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, excess humus.
48 Wabasso	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
49 Wabasso	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.
50 Wabasso Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
51 Wauchula	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
52 Waveland	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
53:*						
Wulfert	Severe: cutbanks cave, excess humus, wetness.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness.	Severe: flooding, wetness, low strength.	Severe: low strength, wetness, flooding.	Severe: excess salt, excess sulfur, wetness.
Kesson	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: excess salt, excess sulfur, wetness.
54, 55 Zolfo	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1------------------ Adamsville Variant	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
2.* Beaches					
3------------------ Braden	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage.
4------------------ Bradenton	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
5------------------ Bradenton	Severe: wetness.	Severe: wetness.	Severe: depth to rock, seepage, wetness.	Severe: wetness.	Poor: wetness.
6------------------ Broward Variant	Severe: depth to rock, wetness.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, seepage, too sandy.
7:* Canova-------------	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
Anclote------------	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: wetness, seepage, too sandy.
Okeelanta----------	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
8, 9--------------- Canaveral	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
10----------------- Canaveral	Severe: wetness.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, excess humus.
11----------------- Cassia	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
12----------------- Cassia	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
13-----------------Chobee	Severe: wetness, percs slowly.	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
14-----------------Chobee Variant	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: hard to pack, ponding.
15, 16*-------------Delray	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
17:*					
Delray-------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
EauGallie----------	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: too sandy, wetness, seepage.
18:*					
Delray-------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Pomona-------------	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
19-----------------Duette	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
20-----------------EauGallie	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: too sandy, wetness, seepage.
21-----------------Estero	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
22-----------------Felda	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
23:*					
Felda--------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Palmetto-----------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
24:*					
Felda	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Wabasso	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
25 Floridana	Severe: wetness, percs slowly.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
26:*					
Floridana	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: ponding, seepage.	Poor: ponding.
Immokalee	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Okeelanta	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
27 Gator	Severe: flooding, ponding.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus, excess salt.
28 Hallandale	Severe: depth to rock, wetness.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, seepage, too sandy.
29 Manatee	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
30, 31 Myakka	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
32 Myakka	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
33 Myakka	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
34 Okeelanta	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, wetness, excess humus.
35 Ona	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
36-------------------Orlando	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
37**-----------------Orsino	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
38-------------------Palmetto	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
39*------------------Parkwood Variant	Severe: depth to rock, wetness.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, wetness, thin layer.
40-------------------Pinellas	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
41.* Pits and Dumps					
42-------------------Pomello	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
43-------------------St. Johns	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
44:*					
St. Johns-----------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Myakka--------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
45**-----------------Tavares	Moderate: wetness.	Severe: seepage.	Severe: wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
46**-----------------Tavares	Moderate: wetness.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
47-------------------Tomoka	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding.
48-------------------Wabasso	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: wetness.	Poor: seepage, too sandy, wetness.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
49------------------ Wabasso	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
50------------------ Wabasso Variant	Severe: depth to rock, wetness, percs slowly.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, seepage, too sandy.
51------------------ Wauchula	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
52------------------ Waveland	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness, cemented pan.	Poor: area reclaim, seepage, too sandy.
53:*					
Wulfert------------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, wetness, excess humus.
Kesson-------------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
54, 55-------------- Zolfo	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

** There may be a hazard of contamination of ground water supplies in areas that have a large number of septic tank absorption fields because of inadequate filtration of the effluent.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1---------------------- Adamsville Variant	Poor: wetness.	Probable--------------	Improbable: too sandy.	Poor: too sandy, wetness.
2.* Beaches				
3---------------------- Braden	Fair: wetness.	Improbable: thin layer.	Improbable: excess fines.	Poor: too sandy.
4---------------------- Bradenton	Poor: wetness.	Probable--------------	Improbable: too sandy.	Poor: too sandy, wetness.
5---------------------- Bradenton	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
6---------------------- Broward Variant	Poor: area reclaim, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
7:*				
Canova----------------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Anclote---------------	Poor: wetness.	Probable--------------	Improbable: too sandy.	Poor: wetness, too sandy.
Okeelanta-------------	Poor: wetness.	Probable--------------	Improbable: too sandy.	Poor: excess humus, wetness.
8, 9------------------ Canaveral	Fair: wetness.	Probable--------------	Improbable: too sandy.	Poor: too sandy.
10--------------------- Canaveral	Fair: thin layer.	Probable--------------	Improbable: too sandy.	Poor: too sandy.
11--------------------- Cassia	Fair: wetness.	Probable--------------	Improbable: too sandy.	Poor: too sandy.
12--------------------- Cassia	Good------------------	Probable--------------	Improbable: too sandy.	Poor: too sandy.
13--------------------- Chobee	Poor: wetness.	Improbable: excess fines.	Improbable: too sandy.	Poor: wetness.
14--------------------- Chobee Variant	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
15--------------------- Delray	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: wetness.
16*-------------------- Delray	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
17:*				
Delray	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
EauGallie	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
18:*				
Delray	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Pomona	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
19 Duette	Good	Probable	Improbable: too sandy.	Poor: too sandy.
20 EauGallie	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
21 Estero	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, excess salt, wetness.
22 Felda	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
23:*				
Felda	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Palmetto	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
24:*				
Felda	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Wabasso	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
25 Floridana	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
26:*				
Floridana	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
Immokalee	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Okeelanta	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
27-------------------- Gator	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: excess humus, excess salt, wetness.
28-------------------- Hallandale	Poor: area reclaim, thin layer, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: area reclaim, too sandy, wetness.
29-------------------- Manatee	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
30, 31, 32------------ Myakka	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
33-------------------- Myakka	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, excess salt, wetness.
34-------------------- Okeelanta	Poor: low strength, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: excess humus, excess salt, wetness.
35-------------------- Ona	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
36-------------------- Orlando	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
37-------------------- Orsino	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
38-------------------- Palmetto	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
39*------------------- Parkwood Variant	Poor: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
40-------------------- Pinellas	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
41.* Pits and Dumps				
42-------------------- Pomello	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
43-------------------- St. Johns	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
44:* St. Johns------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
Myakka---------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
45, 46 Tavares	Good	Probable	Improbable: too sandy.	Poor: too sandy.
47 Tomoka	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
48 Wabasso	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
49 Wabasso	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
50 Wabasso Variant	Poor: area reclaim, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
51 Wauchula	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
52 Waveland	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
53:*				
Wulfert	Poor: low strength, wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness, excess salt.
Kesson	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, excess salt, wetness.
54, 55 Zolfo	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
1. Adamsville Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
2.* Beaches						
3. Braden	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, fast intake, soil blowing.	Favorable.
4. Bradenton	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
5. Bradenton	Moderate: depth to rock.	Severe: wetness.	Moderate: slow refill, depth to rock.	Favorable	Wetness, fast intake, soil blowing.	Wetness.
6. Broward Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: depth to rock, cutbanks cave.	Depth to rock, cutbanks cave.	Wetness, fast intake, soil blowing.	Wetness, depth to rock.
7:*						
Canova	Severe: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, subsides.	Ponding, soil blowing.	Wetness.
Anclote	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, fast intake, soil blowing.	Wetness.
Okeelanta	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, cutbanks cave.	Ponding, soil blowing.	Wetness.
8. Canaveral	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
9. Canaveral	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Slope, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
10. Canaveral	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Subsides, cutbanks cave.	Wetness, droughty, fast intake.	Droughty.
11. Cassia	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
12. Cassia	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
13. Chobee	Slight	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly	Wetness, fast intake, soil blowing.	Wetness, rooting depth, percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
14----------------- Chobee Variant	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.
15, 16*----------- Delray	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
17:*						
Delray-----------	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
EauGallie--------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Fast intake, wetness, droughty.	Wetness, droughty.
18:*						
Delray-----------	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
Pomona-----------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
19----------------- Duette	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
20----------------- EauGallie	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Fast intake, wetness, droughty.	Wetness, droughty.
21----------------- Estero	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: salty water, cutbanks cave.	Flooding, cutbanks cave, excess salt.	Wetness, soil blowing, flooding.	Wetness, excess salt.
22----------------- Felda	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
23:*						
Felda------------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
Palmetto---------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
24:*						
Felda------------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
Wabasso----------	Severe: seepage.	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, flooding.	Wetness, fast intake, soil blowing.	Wetness.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
25----------------- Floridana	Severe: seepage.	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly---	Wetness, fast intake, soil blowing.	Wetness, percs slowly.
26:*						
Floridana---------	Severe: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly.	Ponding, fast intake, soil blowing.	Wetness, percs slowly.
Immokalee---------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
Okeelanta---------	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, cutbanks cave.	Ponding, soil blowing.	Wetness.
27----------------- Gator	Severe: seepage.	Severe: excess humus, ponding, excess salt.	Severe: salty water, cutbanks cave.	Ponding, flooding, subsides.	Ponding, flooding, excess salt.	Wetness, excess salt.
28----------------- Hallandale	Severe: depth to rock.	Severe: seepage, piping, wetness.	Severe: depth to rock, cutbanks cave.	Depth to rock, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty, depth to rock.
29----------------- Manatee	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Favorable------	Wetness, fast intake, soil blowing.	Wetness.
30, 31, 32--------- Myakka	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
33----------------- Myakka	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: salty water, cutbanks cave.	Flooding, cutbanks cave, excess salt.	Wetness, droughty, fast intake.	Wetness, excess salt, droughty.
34----------------- Okeelanta	Severe: seepage.	Severe: excess humus, wetness, excess salt.	Severe: salty water, cutbanks cave.	Flooding, subsides.	Wetness, soil blowing, flooding.	Wetness, excess salt.
35----------------- Ona	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, fast intake, soil blowing.	Wetness.
36----------------- Orlando	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
37----------------- Orsino	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
38----------------- Palmetto	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
39*---------------- Parkwood Variant	Moderate: depth to rock.	Severe: wetness.	Severe: depth to rock.	Depth to rock	Wetness, fast intake, soil blowing.	Wetness, depth to rock.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
40----------------- Pinellas	Severe: seepage.	Severe: seepage, piping, wetness.	Moderate: slow refill.	Favorable-------	Wetness, droughty, fast intake.	Wetness.
41.* Pits and Dumps						
42----------------- Pomello	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
43----------------- St. Johns	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, fast intake, soil blowing.	Wetness.
44:* St. Johns---------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, fast intake, soil blowing.	Wetness.
Myakka------------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, slope.	Wetness, droughty, fast intake.	Wetness, droughty.
45----------------- Tavares	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
46----------------- Tavares	Severe: seepage.	Severe: seepage, too sandy.	Severe: slow refill, cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
47----------------- Tomoka	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, subsides.	Ponding---------	Wetness.
48----------------- Wabasso	Severe: seepage.	Severe: seepage, wetness.	Severe: slow refill.	Percs slowly, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
49----------------- Wabasso	Severe: seepage.	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, flooding.	Wetness, fast intake, soil blowing.	Wetness.
50----------------- Wabasso Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, depth to rock, cutbanks cave.	Percs slowly, depth to rock, cutbanks cave.	Wetness, fast intake, soil blowing.	Wetness, depth to rock, percs slowly.
51----------------- Wauchula	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Favorable-------	Wetness, droughty, fast intake.	Wetness, erodes easily, droughty.
52----------------- Waveland	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: no water.	Percs slowly, cemented pan, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty, cemented pan.
53:* Wulfert-----------	Severe: seepage.	Severe: seepage, piping, excess humus.	Severe: salty water, cutbanks cave.	Flooding, subsides, excess salt.	Wetness, soil blowing, flooding.	Wetness, excess salt.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
53:*						
Kesson-----------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: salty water, cutbanks cave.	Flooding, cutbanks cave, excess salt.	Wetness, fast intake, soil blowing.	Wetness, excess salt.
54, 55------------ Zolfo	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1-----------------Adamsville Variant	0-8	Fine sand---------	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	8-80	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	90-100	2-12	---	NP
2.* Beaches											
3-----------------Braden	0-4	Fine sand---------	SP, SP-SM	A-3, A-2-4	0	100	100	85-95	1-12	---	NP
	4-28	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-95	1-12	---	NP
	28-40	Sandy loam, fine sandy loam, sandy clay loam.	SP-SM, SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	85-99	11-35	<40	NP-15
	40-70	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-2-4, A-3	0	100	100	85-99	5-25	---	NP
4-----------------Bradenton	0-4	Fine sand---------	SP-SM	A-3, A-2-4	0	100	100	80-100	5-12	---	NP
	4-9	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	80-100	5-12	---	NP
	9-27	Sandy loam, fine sandy loam, loamy fine sand.	SC, SM-SC	A-2-4, A-2-6	0	100	100	80-100	20-35	<40	4-18
	27-80	Fine sand, loamy fine sand, fine sandy loam.	SP-SM, SM, SM-SC, SC	A-3, A-2-4, A-2-6	0	100	100	80-100	5-35	<40	NP-18
5-----------------Bradenton	0-6	Fine sand---------	SP-SM	A-3, A-2-4	0	100	100	80-100	5-12	---	NP
	6-13	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-100	5-25	---	NP
	13-47	Sandy loam, fine sandy loam.	SM-SC, SC	A-2-4, A-2-6	0	100	100	80-100	20-35	<40	NP-18
	47-77	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
	77-80	Variable----------	SP-SM, SM, SM-SC, SC	A-3, A-2-4, A-2-6, A-6	0	85-100	60-85	55-75	5-45	<40	NP-18
6-----------------Broward Variant	0-14	Fine sand---------	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	14-20	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP
	20-27	Sand, fine sand	SP-SM	A-3	0	100	100	95-100	5-12	---	NP
	27-34	Sand, fine sand	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	34-55	Weathered bedrock	---	---	---	---	---	---	---	---	---
	55-80	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	95-100	90-95	85-90	5-20	---	NP
7:* Canova-----------	0-8	Muck--------------	PT	---	0	---	---	---	---	---	---
	8-24	Sand, fine sand	SP, SP-SM	A-3	0	100	100	90-100	3-10	---	NP
	24-68	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	75-95	15-35	<30	NP-14
Anclote----------	0-16	Fine sand---------	SP, SP-SM	A-3, A-2-4	0	100	95-100	85-100	2-12	---	NP
	16-80	Sand, fine sand, loamy fine sand.	SP, SP-SM, SM	A-3, A-2-4	0	100	95-100	85-100	2-20	---	NP
Okeelanta--------	0-20	Muck--------------	PT	A-8	0	---	---	---	---	---	---
	20-54	Fine sand, sand, loamy sand.	SP, SP-SM, SM	A-3, A-2-4	0	100	85-100	80-95	2-15	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
8---------------- Canaveral	0-6	Fine sand--------	SP	A-3	0	100	100	90-100	1-4	---	NP
	6-65	Fine sand, sand, coarse sand.	SP	A-3	0	70-100	70-95	65-90	1-3	---	NP
9---------------- Canaveral	0-80	Sand-------------	SP	A-3	0	100	100	90-100	1-4	---	NP
10--------------- Canaveral	0-45	Sand-------------	SP	A-3	0	70-90	60-80	50-60	1-4	---	NP
	45-70	Muck-------------	PT	A-8	---	---	---	---	---	---	---
	70-80	Sand, fine sand	SP	A-3	0	100	70-95	65-95	1-3	---	NP
11--------------- Cassia	0-24	Fine sand--------	SP, SP-SM	A-3	0	100	100	90-100	2-7	---	NP
	24-33	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-20	---	NP
	33-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	90-100	2-10	---	NP
12--------------- Cassia	0-29	Fine sand--------	SP, SP-SM	A-3	0	100	100	90-100	2-7	---	NP
	29-41	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	90-100	2-12	---	NP
	41-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	90-100	2-10	---	NP
13--------------- Chobee	0-8	Loamy fine sand	SP-SM, SM	A-2-4	0	100	100	80-99	12-25	<40	NP-10
	8-51	Sandy clay loam	SC	A-2-6, A-2-7, A-6, A-7	0	100	100	85-99	25-45	35-45	20-25
	51-80	Loamy sand, fine sand, sandy clay loam.	SP-SM, SM, SC, SM-SC	A-2-4, A-2-6, A-6, A-7	0	100	100	80-99	12-45	<45	NP-25
14--------------- Chobee Variant	0-20	Sandy clay loam	SC	A-6, A-7	0	100	100	90-100	36-50	35-50	20-35
	20-35	Sandy clay loam, sandy clay.	SC, CL, CH	A-6, A-7	0	100	100	90-100	36-55	35-55	20-40
	35-40	Sandy loam, sandy clay loam, sandy clay.	SM-SC, SC, CL, CH	A-2-4, A-2-6, A-6, A-7	0	100	100	85-100	25-55	15-55	4-35
	40-80	Sand, loamy sand, loamy fine sand.	SM, SM-SC, SC	A-3, A-2-4	0	90-100	85-95	65-85	5-25	<30	NP-7
15--------------- Delray	0-16	Mucky loamy fine sand.	SP-SM, SM, SM-SC	A-3, A-2-4	0	100	100	95-100	5-20	<20	NP-5
	16-51	Fine sand, sand	SP-SM	A-3, A-2-4	0	100	100	95-100	5-12	---	NP
	51-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	95-100	20-35	<40	NP-15
16*-------------- Delray	0-15	Fine sand--------	SP-SM, SM, SM-SC	A-3, A-2-4	0	100	100	95-100	5-20	<20	NP-5
	15-55	Fine sand, sand	SP-SM	A-3, A-2-4	0	100	100	95-100	5-12	---	NP
	55-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	95-100	20-35	<40	NP-15
17:* Delray-----------	0-15	Fine sand--------	SP-SM, SM, SM-SC	A-3, A-2-4	0	100	100	95-100	5-20	<20	NP-5
	15-55	Fine sand, sand	SP-SM	A-3, A-2-4	0	100	100	95-100	5-12	---	NP
	55-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	95-100	20-35	<40	NP-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
17:*											
EauGallie	0-23	Fine sand	SP, SP-SM	A-3	0	100	100	80-98	2-5	---	NP
	23-35	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-98	5-20	---	NP
	35-43	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-98	2-12	---	NP
	43-62	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	80-98	20-35	<40	NP-20
	62-80	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-98	5-25	---	NP
18:*											
Delray	0-15	Fine sand	SP-SM, SM, SM-SC	A-3, A-2-4	0	100	100	95-100	5-20	<20	NP-5
	15-55	Fine sand, sand	SP-SM	A-3, A-2-4	0	100	100	95-100	5-12	---	NP
	55-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	95-100	20-35	<40	NP-15
Pomona	0-22	Fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	22-36	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	36-51	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-15	---	NP
	51-60	Sandy clay loam, sandy loam, sandy clay.	SC, SM-SC	A-2, A-4, A-6	0	100	95-100	85-100	25-50	25-40	4-16
	60-80	Sand, fine sand, loamy fine sand.	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-20	---	NP
19 Duette	0-4	Fine sand	SP	A-3	0	100	100	60-100	1-4	---	NP
	4-58	Fine sand, sand	SP	A-3	0	100	100	60-100	1-4	---	NP
	58-80	Fine sand, sand	SP, SP-SM	A-3, A-2-4	0	100	100	60-100	4-12	---	NP
20 EauGallie	0-28	Fine sand	SP, SP-SM	A-3	0	100	100	80-98	2-5	---	NP
	28-42	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-98	5-20	---	NP
	42-50	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	80-98	20-35	<40	NP-20
	50-65	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-98	5-25	---	NP
21 Estero	0-6	Muck	PT	---	---	---	---	---	---	---	---
	6-14	Fine sand, sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-95	2-12	---	NP
	14-31	Fine sand, sand	SP, SP-SM	A-3	0	100	100	85-95	2-5	---	NP
	31-56	Fine sand, sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-95	2-12	---	NP
	56-80	Fine sand, sand	SP, SP-SM	A-3	0	100	100	80-95	2-5	---	NP
22 Felda	0-24	Fine sand	SP, SP-SM	A-3	0	100	100	90-99	2-5	---	NP
	24-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	90-99	15-35	<40	NP-15
23:*											
Felda	0-25	Fine sand	SP, SP-SM	A-3	0	100	100	90-99	2-5	---	NP
	25-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	90-99	15-35	<40	NP-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
23:* Palmetto	0-25	Sand	SP, SP-SM	A-3, A-2-4	0	100	100	70-95	2-12	---	NP
	25-45	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	70-95	5-12	---	NP
	45-64	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	70-95	15-35	<37	NP-20
	64-68	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	90-100	80-100	60-85	5-25	---	NP
24:* Felda	0-22	Fine sand	SP, SP-SM	A-3	0	100	100	90-99	2-5	---	NP
	22-32	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	90-99	15-35	<40	NP-15
	32-60	Sand, fine sand, loamy sand.	SP, SP-SM	A-3, A-2-4	0	100	100	80-99	2-12	---	NP
Wabasso	0-21	Fine sand	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	21-31	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP
	31-37	Sand, fine sand	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	37-65	Sandy loam, fine sandy loam, sandy clay loam.	SC, SM-SC	A-2-4, A-2-6	0	100	100	95-100	20-35	20-30	5-13
	65-80	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP
25 Floridana	0-15	Fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-90	5-25	---	NP
	15-32	Fine sand, sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
	32-65	Sandy loam, fine sandy loam, sandy clay loam.	SM-SC, SC	A-2-4, A-2-6	0	100	100	85-95	20-35	20-30	7-16
26:* Floridana	0-19	Fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-90	5-25	---	NP
	19-36	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
	36-63	Sandy loam, fine sandy loam, sandy clay loam.	SM-SC, SC	A-2-4, A-2-6	0	100	100	85-95	20-35	20-30	7-16
Immokalee	0-10	Fine sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	10-34	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	34-43	Fine sand, sand	SP, SP-SM	A-3, A-2-4	0	100	100	70-100	5-21	---	NP
	43-80	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
Okeelanta	0-20	Muck	PT	A-8	0	---	---	---	---	---	---
	20-54	Fine sand, sand, loamy sand.	SP, SP-SM, SM	A-3, A-2-4	0	100	85-100	80-95	2-15	---	NP
27 Gator	0-18	Muck	PT	A-8	---	---	---	---	---	---	---
	18-55	Sandy clay loam, sandy loam, fine sandy loam.	SC, SM-SC	A-2, A-4, A-6	0	100	100	85-99	20-40	20-40	4-15
	55-80	Fine sand, sand	SP-SM	A-3, A-2-4	0	100	100	80-99	5-12	---	NP
28 Hallandale	0-6	Fine sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	6-15	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
29--------------- Manatee	0-13	Loamy fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	8-15	---	NP
	13-34	Fine sandy loam, sandy loam.	SM-SC, SC	A-2-4	0	100	100	90-100	18-30	<30	4-10
	34-52	Fine sandy loam, sandy loam, loamy fine sand.	SM, SM-SC, SC	A-2-4	0	95-100	90-100	85-100	13-30	<30	NP-10
	52-80	Fine sandy loam, sandy loam, loamy fine sand.	SM, SM-SC, SC	A-2-4	0-5	60-100	50-100	50-100	13-30	<30	NP-10
30--------------- Myakka	0-23	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	23-37	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	37-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-8	---	NP
31--------------- Myakka	0-12	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	12-33	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	33-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-8	---	NP
32--------------- Myakka	0-26	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	26-41	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	41-80	Sand, fine sand	SP, SP-SM	A-3	0	85-100	60-85	40-60	2-8	---	NP
33--------------- Myakka	0-15	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	15-37	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	37-75	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-8	---	NP
34--------------- Okeelanta	0-39	Muck-------------	PT	A-8	---	---	---	---	---	---	---
	39-60	Sand, fine sand	SP, SP-SM	A-3	0	100	95-100	85-95	2-12	---	NP
35--------------- Ona	0-5	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-95	3-10	---	NP
	5-16	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-95	5-20	---	NP
	16-52	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	3-10	---	NP
	52-68	Sand, fine sand	SP-SM, SM	A-2-4	0	100	100	85-95	12-20	---	NP
	68-80	Sand, fine sand	SP-SM, SM	A-2-4	0	100	100	85-95	12-20	---	NP
36--------------- Orlando	0-12	Fine sand--------	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	1-12	---	NP
	12-80	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	1-12	---	NP
37--------------- Orsino	0-18	Fine sand--------	SP	A-3	0	100	100	85-95	1-3	---	NP
	18-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	2-7	---	NP
38--------------- Palmetto	0-25	Sand-------------	SP, SP-SM	A-3, A-2-4	0	100	100	70-95	2-12	---	NP
	25-45	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	70-95	5-12	---	NP
	45-64	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	70-95	15-35	<37	NP-20
	64-68	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	90-100	80-100	60-85	5-25	---	NP
39*-------------- Parkwood Variant	0-9	Loamy fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-99	3-7	---	NP
	9-37	Sandy loam, fine sandy loam.	SM, SM-SC	A-2-4	0	100	97-100	80-95	20-35	<28	NP-7
	37-80	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
40 Pinellas	0-11	Fine sand	SP	A-3	0	100	100	90-100	2-4	---	NP
	11-33	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	33-45	Fine sandy loam, sandy clay loam.	SP-SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	90-100	12-35	20-30	5-13
	45-60	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0-5	80-100	75-100	60-95	2-12	---	NP
41.* Pits and Dumps											
42 Pomello	0-46	Fine sand	SP, SP-SM	A-3	0	100	100	60-100	1-8	---	NP
	46-80	Coarse sand, sand, fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	60-100	6-15	---	NP
43 St. Johns	0-13	Fine sand	SP, SP-SM	A-3	0	100	100	75-95	3-10	---	NP
	13-28	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	3-10	---	NP
	28-60	Sand, fine sand	SP-SM, SP	A-3, A-2-4	0	100	100	85-95	5-20	---	NP
	60-68	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
44:* St. Johns	0-11	Fine sand	SP, SP-SM	A-3	0	100	100	75-95	3-10	---	NP
	11-26	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	3-10	---	NP
	26-43	Sand, fine sand	SP-SM, SP	A-3, A-2-4	0	100	100	85-95	5-20	---	NP
	43-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
Myakka	0-24	Fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	24-46	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	46-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-8	---	NP
45 Tavares	0-80	Fine sand	SP, SP-SM	A-3	0	100	95-100	85-100	2-8	---	NP
46 Tavares	0-60	Fine sand	SP, SP-SM	A-3	0	100	95-100	85-100	2-8	---	NP
	60-80	Sand, fine sand	---	---	---	---	---	---	---	---	---
47 Tomoka	0-28	Muck	PT	---	0	---	---	---	---	---	NP
	28-35	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-95	5-15	---	NP
	35-75	Sandy clay loam, sandy loam, fine sandy loam.	SM, SM-SC, SC	A-2, A-4, A-6	0	100	100	80-95	25-40	<35	NP-15
48 Wabasso	0-21	Fine sand	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	21-31	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP
	31-37	Sand, fine sand	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	37-65	Sandy loam, fine sandy loam, sandy clay loam.	SC, SM-SC	A-2-4, A-2-6	0	100	100	95-100	20-35	20-30	5-13
	65-80	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP
49 Wabasso	0-21	Fine sand	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	21-31	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP
	31-37	Sand, fine sand	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	37-65	Sandy loam, fine sandy loam, sandy clay loam.	SC, SM-SC	A-2-4, A-2-6	0	100	100	95-100	20-35	20-30	5-13
	65-80	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
50---------------- Wabasso Variant	0-23	Fine sand--------	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	23-30	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP
	30-36	Sandy loam, fine sandy loam, sandy clay loam.	SM-SC, SC	A-2-4, A-2-6	0	100	100	95-100	20-35	20-30	5-13
	36-56	Weathered bedrock	---	---	---	---	---	---	---	---	---
	56-80	Variable---------	SP-SM, SM, SM-SC, SC	A-3, A-2-4, A-2-6	0	95-100	90-95	85-90	5-35	<30	NP-13
51---------------- Wauchula	0-7	Fine sand--------	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	7-20	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	20-29	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	8-25	---	NP
	29-34	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-20	---	NP
	34-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6, A-4, A-6	0	100	92-100	90-100	25-50	<40	NP-20
52---------------- Waveland	0-5	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	5-32	Sand, fine sand	SP	A-3	0	100	100	85-100	1-4	---	NP
	32-40	Sand, fine sand, loamy sand.	SP-SM, SM	A-2-4	0	100	100	85-100	12-20	---	NP
	40-51	Sand, fine sand, loamy sand.	SP-SM, SM	A-2-4	0	100	100	85-95	12-20	---	NP
	51-80	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	85-95	5-12	---	NP
53:*											
Wulfert----------	0-12	Muck-------------	PT	---	---	---	---	---	---	---	---
	12-36	Muck-------------	PT	---	---	---	---	---	---	---	---
	36-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-18	---	NP
Kesson-----------	0-6	Fine sand--------	SP-SM	A-3, A-2-4	0	100	100	95-100	5-12	---	NP
	6-25	Sand, fine sand	SP, SP-SM	A-3	0	90-100	90-100	90-100	2-10	---	NP
	25-45	Sand, fine sand	SP, SP-SM	A-3	0	70-100	65-95	60-95	2-10	---	NP
	45-80	Sand, fine sand	SP, SP-SM	A-3	0	90-100	90-100	90-100	2-10	---	NP
54---------------- Zolfo	0-7	Fine sand--------	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	7-65	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-18	---	NP
	65-80	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-18	---	NP
55---------------- Zolfo	0-3	Fine sand--------	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	3-65	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-18	---	NP
	65-80	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-18	---	NP

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH	Mmhos/cm					Pct
1---------------- Adamsville Variant	0-8	1-8	1.35-1.45	6.0-20	0.05-0.10	4.5-5.5	<2	Low--------	0.10	5	2	1-5
	8-80	1-8	1.40-1.60	6.0-20	<0.05	4.5-5.5	<2	Low--------	0.10			
2.* Beaches												
3---------------- Braden	0-4	2-6	1.30-1.45	6.0-20	0.10-0.15	4.5-5.5	<2	Low--------	0.17	5	2	1-3
	4-28	2-6	1.55-1.65	6.0-20	0.05-0.10	4.5-5.5	<2	Low--------	0.17			
	28-40	10-30	1.55-1.70	0.6-2.0	0.10-0.15	3.6-5.5	<2	Low--------	0.28			
	40-70	4-12	1.55-1.65	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.17			
4---------------- Bradenton	0-4	1-6	1.30-1.50	6.0-20	0.08-0.12	5.6-7.3	<2	Low--------	0.20	5	---	2-8
	4-9	1-6	1.50-1.70	6.0-20	0.03-0.07	5.6-7.3	<2	Low--------	0.20			
	9-27	10-18	1.55-1.70	0.6-2.0	0.10-0.15	6.1-8.4	<2	Low--------	0.24			
	27-80	1-18	1.55-1.70	0.6-6.0	0.03-0.10	7.4-8.4	<2	Low--------	0.24			
5---------------- Bradenton	0-6	1-6	1.30-1.50	6.0-20	0.05-0.10	5.6-7.8	<2	Low--------	0.20	5	1	2-8
	6-13	5-13	1.50-1.65	6.0-20	0.05-0.10	5.6-7.8	<2	Low--------	0.20			
	13-47	10-18	1.55-1.70	0.6-2.0	0.10-0.15	6.1-7.8	<2	Low--------	0.24			
	47-77	---	---	---	---	---	<2	-----------	----			
	77-80	5-25	1.50-1.70	6.0-0.6	0.05-0.15	7.9-8.4	<2	Low--------	0.24			
6---------------- Broward Variant	0-14	<5	1.25-1.55	6.0-20	<0.05	4.5-6.5	<2	Low--------	0.17	2	2	1-4
	14-20	1-12	1.50-1.70	0.6-2.0	0.10-0.15	4.5-7.3	<2	Low--------	0.20			
	20-27	<5	1.45-1.65	6.0-20	0.05-0.10	4.5-7.3	<2	Low--------	0.17			
	27-34	<5	1.45-1.65	6.0-20	0.05-0.10	5.1-7.3	<2	Low--------	0.17			
	34-55	---	---	---	---	---	<2	-----------	----			
	55-80	1-12	1.50-1.70	6.0-20	0.10-0.15	7.4-8.4	<2	Low--------	0.17			
7:*												
Canova-----------	0-8	---	0.2-0.4	6.0-20	0.10-0.20	5.6-6.5	<2	-----------	----	---	2	35-75
	8-24	1-6	1.35-1.50	6.0-20	0.02-0.05	6.1-8.4	<2	Low--------	0.17			
	24-68	15-25	1.60-1.70	0.6-6.0	0.10-0.15	7.4-8.4	<2	Low--------	0.28			
Anclote----------	0-16	2-8	1.30-1.45	6.0-20	0.10-0.15	5.6-8.4	<2	Low--------	0.17	5	2	2-10
	16-80	2-13	1.50-1.65	6.0-20	0.03-0.10	5.6-8.4	<2	Low--------	0.17			
Okeelanta--------	0-20	---	0.22-0.38	6.0-20	0.20-0.30	4.5-6.5	<2	Low--------	----	---	2	>70
	20-54	1-5	1.30-1.55	6.0-20	0.05-0.10	5.1-7.8	<2	Low--------	0.15			
8---------------- Canaveral	0-6	<2	1.25-1.50	>20	0.02-0.05	6.6-8.4	<2	Low--------	0.10	5	2	<.5
	6-65	<1	1.25-1.50	>20	0.02-0.05	6.6-8.4	<2	Low--------	0.10			
9---------------- Canaveral	0-80	<2	1.25-1.50	>20	0.02-0.05	6.6-8.4	<2	Low--------	0.10	5	2	<.5
10--------------- Canaveral	0-45	2-8	1.25-1.50	>20	<0.05	6.6-8.4	<2	Low--------	0.10	4	2	<.5
	45-70	---	0.25-0.35	2.0-6.0	>0.20	6.6-8.4	<2	-----------	----			
	70-80	1-8	1.30-1.50	6.0-20	<0.05	6.6-8.4	<2	Low--------	0.10			
11--------------- Cassia	0-24	1-4	1.30-1.55	6.0-20	0.03-0.07	4.5-6.0	<2	Low--------	0.10	5	2	<1
	24-33	2-10	1.30-1.55	0.6-6.0	0.10-0.15	4.5-6.0	<2	Low--------	0.10			
	33-80	1-5	1.40-1.60	6.0-20	0.03-0.07	4.5-6.0	<2	Low--------	0.10			
12--------------- Cassia	0-29	1-4	1.30-1.55	>20	<0.05	4.5-6.0	<2	Low--------	0.10	5	2	<1
	29-41	1-8	1.30-1.55	2.0-6.0	0.10-0.15	4.5-6.0	<2	Low--------	0.10			
	41-80	1-5	1.40-1.60	>20	<0.05	4.5-6.0	<2	Low--------	0.10			
13--------------- Chobee	0-8	7-15	1.45-1.50	2.0-6.0	0.10-0.15	6.1-7.3	<2	Low--------	0.10	5	3	2-7
	8-51	20-35	1.55-1.75	<0.2	0.12-0.17	7.4-8.4	<2	Moderate	0.32			
	51-80	7-20	1.60-1.75	0.2-6.0	0.06-0.10	7.4-8.4	<2	Low--------	0.20			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
14---------------- Chobee Variant	0-20	22-30	1.55-1.65	0.06-0.2	>0.20	5.6-7.3	<2	High------	0.37	4	4	2-5
	20-35	22-40	1.55-1.65	0.06-0.2	>0.20	7.9-8.4	<2	High------	0.37			
	35-40	12-40	1.55-1.70	0.06-0.6	0.10-0.20	7.9-8.4	<2	Moderate	0.32			
	40-80	3-12	1.55-1.65	6.0-20	0.05-0.15	7.9-8.4	<2	Low--------	0.20			
15---------------- Delray	0-16	2-13	1.25-1.40	6.0-20	0.15-0.25	5.6-7.3	<2	Low--------	0.10	5	2	6-12
	16-51	1-7	1.50-1.65	6.0-20	0.05-0.08	6.1-7.3	<2	Low--------	0.10			
	51-80	13-30	1.45-1.60	0.6-6.0	0.10-0.15	6.6-7.8	<2	Low--------	0.24			
16*--------------- Delray	0-15	3-13	1.35-1.45	6.0-20	0.10-0.15	5.6-7.3	<2	Low--------	0.10	5	2	2-5
	15-55	1-7	1.50-1.65	6.0-20	0.05-0.08	6.1-7.3	<2	Low--------	0.10			
	55-80	13-30	1.45-1.60	0.6-6.0	0.10-0.15	6.6-7.8	<2	Low--------	0.24			
17:*												
Delray-----------	0-15	3-13	1.35-1.45	6.0-20	0.10-0.15	5.6-7.3	<2	Low--------	0.10	5	2	2-5
	15-55	1-7	1.50-1.65	6.0-20	0.05-0.08	6.1-7.3	<2	Low--------	0.10			
	55-80	13-30	1.45-1.60	0.6-6.0	0.10-0.15	6.6-7.8	<2	Low--------	0.24			
EauGallie--------	0-23	<5	1.25-1.50	6.0-20	0.02-0.05	4.5-6.0	<2	Low--------	0.10	5	2	2-8
	23-35	1-8	1.45-1.60	0.6-6.0	0.05-0.10	5.1-6.5	<2	Low--------	0.15			
	35-43	1-5	1.45-1.65	6.0-20	0.02-0.05	5.6-7.8	<2	Low--------	0.10			
	43-62	13-31	1.55-1.70	0.6-6.0	0.10-0.15	5.6-7.8	<2	Low--------	0.20			
	62-80	1-13	1.45-1.55	2.0-6.0	0.05-0.10	5.6-7.8	<2	Low--------	0.15			
18:*												
Delray-----------	0-15	3-13	1.35-1.45	6.0-20	0.10-0.15	5.6-7.3	<2	Low--------	0.10	5	2	2-5
	15-55	1-7	1.50-1.65	6.0-20	0.05-0.08	6.1-7.3	<2	Low--------	0.10			
	55-80	13-30	1.45-1.60	0.6-6.0	0.10-0.15	6.6-7.8	<2	Low--------	0.24			
Pomona-----------	0-22	1-6	1.20-1.50	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.20	5	2	1-2
	22-36	1-6	1.45-1.70	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.20			
	36-51	2-7	1.30-1.60	0.6-2.0	0.10-0.15	3.6-5.5	<2	Low--------	0.20			
	51-60	16-36	1.50-1.70	0.2-0.6	0.13-0.17	3.6-5.5	<2	Low--------	0.32			
	60-80	1-6	1.40-1.60	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.20			
19---------------- Duette	0-4	<2	1.30-1.55	>20	0.03-0.06	4.5-7.0	<2	Low--------	0.05	5	1	<1
	4-58	<2	1.40-1.70	>20	0.02-0.05	4.5-7.0	<2	Low--------	0.05			
	58-80	1-5	1.45-1.60	2.0-6.0	0.10-0.15	4.5-6.5	<2	Low--------	0.05			
20---------------- EauGallie	0-28	<5	1.25-1.50	6.0-20	0.02-0.05	4.5-6.0	<2	Low--------	0.10	5	2	2-8
	28-42	1-8	1.45-1.60	0.6-6.0	0.05-0.10	5.1-6.5	<2	Low--------	0.15			
	42-50	13-31	1.55-1.70	0.6-6.0	0.10-0.15	5.6-7.8	<2	Low--------	0.20			
	50-65	1-13	1.45-1.55	2.0-6.0	0.05-0.10	5.6-7.8	<2	Low--------	0.15			
21---------------- Estero	0-6	---	0.25-0.35	6.0-20	0.20-0.35	6.6-8.4	>16	Low--------	----	---	2	---
	6-14	1-6	1.55-1.70	6.0-20	0.10-0.15	6.6-8.4	>16	Low--------	0.10			
	14-31	2-7	1.60-1.70	6.0-20	0.07-0.13	6.6-8.4	>16	Low--------	0.10			
	31-56	2-7	1.55-1.65	2.0-6.0	0.10-0.15	4.5-5.5	>16	Low--------	0.10			
	56-80	1-4	1.60-1.70	6.0-20	0.05-0.10	4.5-5.5	>16	Low--------	0.10			
22---------------- Felda	0-24	1-3	1.40-1.55	6.0-20	0.02-0.05	5.1-7.8	<2	Low--------	0.10	5	2	1-4
	24-80	13-30	1.50-1.65	0.6-6.0	0.10-0.15	6.6-7.8	<2	Low--------	0.24			
23:*												
Felda------------	0-25	1-3	1.40-1.55	6.0-20	0.02-0.05	5.1-7.8	<2	Low--------	0.10	5	2	1-4
	25-80	13-30	1.50-1.65	0.6-6.0	0.10-0.15	6.6-7.8	<2	Low--------	0.24			
Palmetto---------	0-25	1-7	1.40-1.60	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.17	5	2	1-3
	25-45	3-8	1.50-1.60	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.17			
	45-64	13-30	1.60-1.70	0.2-0.6	0.10-0.15	4.5-5.5	<2	Low--------	0.28			
	64-68	5-13	1.50-1.65	2.0-6.0	0.08-0.12	4.5-5.5	<2	Low--------	0.20			
24:*												
Felda------------	0-22	1-3	1.40-1.55	6.0-20	0.02-0.05	5.1-7.8	<2	Low--------	0.10	5	2	1-4
	22-32	13-30	1.50-1.65	0.6-6.0	0.10-0.15	6.6-7.8	<2	Low--------	0.24			
	32-60	1-10	1.50-1.65	6.0-20	0.02-0.05	6.6-8.4	<2	Low--------	0.10			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
24:*												
Wabasso----------	0-21	<5	1.25-1.55	6.0-20	<0.05	4.5-6.5	<2	Low--------	0.10	5	2	1-4
	21-31	1-12	1.50-1.75	0.6-6.0	0.10-0.15	4.5-7.3	<2	Low--------	0.10			
	31-37	2-5	1.40-1.55	6.0-20	<0.05	5.1-8.4	<2	Low--------	0.15			
	37-65	12-30	1.60-1.80	<0.2	0.10-0.15	5.1-8.4	<2	Low--------	0.24			
	65-80	2-12	1.40-1.70	6.0-20	0.05-0.10	7.4-8.4	<2	Low--------	0.10			
25--------------- Floridana	0-15	3-10	1.40-1.49	6.0-20	0.10-0.15	5.6-8.4	<2	Low--------	0.10	5	2	6-15
	15-32	1-7	1.52-1.58	6.0-20	0.05-0.10	5.6-8.4	<2	Low--------	0.10			
	32-65	15-30	1.60-1.69	<0.2	0.10-0.15	5.6-8.4	<2	Low--------	0.24			
26:*												
Floridana--------	0-19	3-10	1.40-1.49	6.0-20	0.10-0.15	5.6-8.4	<2	Low--------	0.10	5	2	6-15
	19-36	1-7	1.52-1.53	6.0-20	0.05-0.10	5.6-8.4	<2	Low--------	0.10			
	36-63	15-30	1.60-1.69	<0.2	0.10-0.15	5.6-8.4	<2	Low--------	0.24			
Immokalee--------	0-10	1-5	1.20-1.50	6.0-20	0.05-0.08	4.5-6.0	<2	Low--------	0.10	5	2	1-2
	10-34	1-5	1.45-1.70	6.0-20	0.02-0.05	4.5-6.0	<2	Low--------	0.10			
	34-43	2-7	1.30-1.60	0.6-2.0	0.10-0.15	4.5-6.0	<2	Low--------	0.15			
	43-80	1-5	1.40-1.60	6.0-20	0.02-0.05	4.5-6.0	<2	Low--------	0.10			
Okeelanta--------	0-20	---	0.22-0.38	6.0-20	0.20-0.30	4.5-6.5	<2	Low--------	----	---	2	>70
	20-54	1-5	1.30-1.55	6.0-20	0.05-0.10	5.1-7.8	<2	Low--------	0.15			
27--------------- Gator	0-18	0-2	0.20-0.30	6.0-20	0.30-0.40	3.6-6.0	>16	Low--------	----	---	---	55-80
	18-55	14-30	1.60-1.70	0.6-2.0	0.10-0.15	6.1-8.4	2-8	Low--------	0.32			
	55-80	2-7	1.40-1.65	6.0-20	0.03-0.05	6.1-8.4	2-4	Low--------	0.15			
28--------------- Hallandale	0-6	<3	1.35-1.45	6.0-20	0.05-0.10	5.1-6.5	<2	Low--------	0.17	2	2	2-5
	6-15	<3	1.50-1.60	6.0-20	0.03-0.05	5.6-8.4	<2	Low--------	0.17			
	15	---	---	---	---	---	---	-----------	----			
29--------------- Manatee	0-13	2-8	1.20-1.40	2.0-6.0	0.15-0.20	5.6-7.8	<2	Low--------	0.10	5	2	4-15
	13-34	10-20	1.50-1.65	0.6-2.0	0.10-0.15	6.6-7.8	<2	Low--------	0.24			
	34-52	6-20	1.55-1.70	0.6-2.0	0.08-0.15	7.4-8.4	<2	Low--------	0.24			
	52-80	6-20	1.55-1.70	0.6-2.0	0.08-0.15	7.4-8.4	<2	Low--------	0.24			
30--------------- Myakka	0-23	<2	1.36-1.44	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10	5	2	1-2
	23-37	2-8	1.47-1.59	0.6-6.0	0.10-0.15	3.6-6.5	<2	Low--------	0.15			
	37-80	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10			
31--------------- Myakka	0-12	<2	1.36-1.44	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10	5	2	1-2
	12-33	2-8	1.47-1.59	0.6-6.0	0.10-0.15	3.6-6.5	<2	Low--------	0.15			
	33-80	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10			
32--------------- Myakka	0-26	<2	1.35-1.45	6.0-20	<0.05	5.1-6.0	<2	Low--------	0.10	5	2	1-2
	26-41	2-8	1.45-1.60	0.6-6.0	0.10-0.15	5.6-7.3	<2	Low--------	0.15			
	41-80	<1	1.30-1.45	>20	<0.05	6.6-8.4	<2	Low--------	0.10			
33--------------- Myakka	0-15	<2	1.35-1.45	6.0-20	>0.05	6.6-8.4	>16	Low--------	0.20	5	2	<1
	15-37	2-8	1.45-1.60	0.6-6.0	0.10-0.15	6.6-8.4	>16	Low--------	0.20			
	37-75	<2	1.50-1.60	6.0-20	>0.05	6.6-8.4	>16	Low--------	0.17			
34--------------- Okeelanta	0-39	---	0.22-0.38	6.0-20	0.20-0.30	7.4-8.4	>16	-----------	----	---	2	>70
	39-60	1-5	1.30-1.55	6.0-20	0.05-0.10	7.4-8.4	>16	Low--------	0.17			
35--------------- Ona	0-5	1-7	1.40-1.55	6.0-20	0.10-0.15	4.5-6.0	<2	Low--------	0.17	5	2	1-5
	5-16	3-8	1.50-1.65	0.6-2.0	0.10-0.15	4.5-6.0	<2	Low--------	0.20			
	16-52	1-4	1.50-1.65	6.0-20	0.05-0.10	4.5-6.0	<2	Low--------	0.17			
	52-68	3-12	1.40-1.70	<0.2	0.10-0.15	4.5-6.0	<2	Low--------	0.24			
	68-80	3-12	1.45-1.65	0.06-0.6	0.10-0.15	4.5-6.0	<2	Low--------	0.20			
36--------------- Orlando	0-12	1-8	1.35-1.45	6.0-20	0.05-0.10	4.5-6.5	<2	Low--------	0.15	5	2	1-5
	12-80	1-8	1.40-1.60	6.0-20	<0.05	4.5-6.0	<2	Low--------	0.15			
37--------------- Orsino	0-18	<1	1.35-1.55	>20	0.02-0.08	4.5-6.0	<2	Low--------	0.17	5	2	<1
	18-80	<2	1.35-1.55	>20	0.02-0.08	4.5-6.0	<2	Low--------	0.17			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
38----------------	0-25	1-7	1.40-1.60	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.17	5	2	1-3
Palmetto	25-45	3-8	1.50-1.60	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.17			
	45-64	13-30	1.60-1.70	0.2-0.6	0.10-0.15	4.5-5.5	<2	Low--------	0.28			
	64-68	5-13	1.50-1.65	2.0-6.0	0.08-0.12	4.5-5.5	<2	Low--------	0.20			
39*---------------	0-9	2-5	1.20-1.40	>20	0.05-0.11	6.6-7.8	<2	Low--------	0.10	5	2	2-4
Parkwood Variant	9-37	10-18	1.50-1.65	2.0-6.0	0.10-0.14	7.4-8.4	<2	Low--------	0.24			
	37-80	---	---	---	---	---	---	-----------	----			
40----------------	0-11	1-3	1.15-1.50	6.0-20	0.02-0.05	5.6-7.8	<2	Low--------	0.17	5	2	1-4
Pinellas	11-33	3-8	1.40-1.60	6.0-20	0.10-0.15	6.6-9.0	<2	Low--------	0.17			
	33-45	13-30	1.50-1.65	0.6-2.0	0.10-0.15	6.6-9.0	<2	Low--------	0.24			
	45-60	2-8	1.55-1.65	6.0-20	0.02-0.05	7.9-8.4	<2	Low--------	0.17			
41.*												
Pits and Dumps												
42----------------	0-46	<2	1.35-1.65	>20	0.02-0.05	4.5-6.0	<2	Low--------	0.10	5	1	<1
Pomello	46-80	<5	1.45-1.60	2.0-6.0	0.10-0.15	4.5-6.0	<2	Low--------	0.15			
43----------------	0-13	1-4	1.30-1.50	6.0-20	0.10-0.15	4.5-5.5	<2	Low--------	0.10	5	1	2-4
St. Johns	13-28	1-3	1.50-1.70	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.10			
	28-60	2-6	1.50-1.58	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low--------	0.15			
	60-68	1-4	1.50-1.65	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.10			
44:*												
St. Johns--------	0-11	1-4	1.30-1.50	6.0-20	0.10-0.15	4.5-5.5	<2	Low--------	0.10	5	1	2-4
	11-26	1-3	1.50-1.70	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.10			
	26-43	2-6	1.50-1.58	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low--------	0.15			
	43-80	1-4	1.50-1.65	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.10			
Myakka-----------	0-24	<2	1.36-1.44	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10	5	2	1-2
	24-46	2-8	1.47-1.59	0.6-6.0	0.10-0.15	3.6-6.5	<2	Low--------	0.15			
	46-80	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10			
45----------------	0-80	1-4	1.55-1.65	>20	0.02-0.05	4.5-6.0	<2	Low--------	0.10	5	2	.5-1
Tavares												
46----------------	0-60	1-4	1.55-1.65	>20	>0.05	4.5-6.0	<2	Low--------	0.10	3	2	.5-1
Tavares	60-80	---	1.60-1.70	0.06-0.2	---	---	<2	Low--------	----			
47----------------	0-28	<5	0.25-0.30	6.0-20	0.30-0.50	3.6-4.4	<2	Low--------	----	---	2	>30
Tomoka	28-35	1-9	1.35-1.60	6.0-20	0.05-0.10	3.6-4.4	<2	Low--------	0.17			
	35-75	15-30	1.60-1.70	0.6-6.0	0.10-0.15	3.6-4.4	<2	Low--------	0.28			
48----------------	0-21	<5	1.25-1.55	6.0-20	0.02-0.05	4.5-6.5	<2	Low--------	0.10	5	2	1-4
Wabasso	21-31	1-12	1.50-1.75	0.6-2.0	0.10-0.15	4.5-7.3	<2	Low--------	0.10			
	31-37	2-5	1.40-1.55	6.0-20	0.02-0.05	5.1-8.4	<2	Low--------	0.15			
	37-65	12-30	1.60-1.80	<0.2	0.10-0.15	5.1-8.4	<2	Low--------	0.24			
	65-80	2-12	1.40-1.70	6.0-20	0.05-0.10	7.4-8.4	<2	Low--------	0.10			
49----------------	0-21	<5	1.25-1.55	6.0-20	<0.05	4.5-6.5	<2	Low--------	0.10	5	2	1-4
Wabasso	21-31	1-12	1.50-1.75	0.6-6.0	0.10-0.15	4.5-7.3	<2	Low--------	0.10			
	31-37	2-5	1.40-1.55	6.0-20	<0.05	5.1-8.4	<2	Low--------	0.15			
	37-65	12-30	1.60-1.80	<0.2	0.10-0.15	5.1-8.4	<2	Low--------	0.24			
	65-80	2-12	1.40-1.70	6.0-20	0.05-0.10	7.4-8.4	<2	Low--------	0.10			
50----------------	0-23	<5	1.25-1.55	6.0-20	<0.05	4.5-6.5	<2	Low--------	0.10	2	2	1-4
Wabasso Variant	23-30	1-12	1.50-1.70	0.6-2.0	0.10-0.15	4.5-7.3	<2	Low--------	0.15			
	30-36	12-30	1.60-1.70	0.06-0.6	0.10-0.15	5.1-8.4	<2	Low--------	0.24			
	36-56	---	---	---	---	---	<2	-----------	----			
	56-80	2-30	1.50-1.70	6.0-0.2	0.05-0.15	7.9-8.4	<2	Low--------	0.20			
51----------------	0-7	<2	1.36-1.44	6.0-20	0.08-0.15	3.6-5.5	<2	Low--------	0.10	5	2	1-2
Wauchula	7-20	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-5.5	<2	Low--------	0.10			
	20-29	2-8	1.47-1.59	0.6-6.0	0.15-0.25	3.6-5.5	<2	Low--------	0.15			
	29-34	<2	1.48-1.61	6.0-20	0.08-0.10	4.5-5.5	<2	Low--------	0.10			
	34-80	15-30	1.60-1.69	0.6-6.0	0.11-0.17	4.5-5.5	<2	Low--------	0.24			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH	Mmhos/cm					Pct
52----------------- Waveland	0-5	<1	1.30-1.60	>6.0	0.03-0.08	3.6-7.3	<2	Low--------	0.24	5	2	1-3
	5-32	<1	1.50-1.70	>6.0	0.01-0.03	3.6-6.0	<2	Low--------	0.24			
	32-40	2-8	1.00-1.65	<0.2	0.10-0.15	3.6-6.0	<2	Low--------	0.24			
	40-51	3-12	1.42-1.70	<0.6	0.10-0.15	3.6-5.5	<2	Low--------	0.24			
	51-80	3-10	1.45-1.60	2.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.24			
53:*												
Wulfert----------	0-12	0-1	0.20-0.40	6.0-20	0.20-0.25	5.6-7.3	>16	-----------	----	---	2	---
	12-36	1-5	0.30-0.40	6.0-20	0.10-0.15	3.6-7.3	>16	-----------	----			
	36-60	2-5	1.50-1.60	6.0-20	0.02-0.08	3.6-7.3	>16	Low--------	0.17			
Kesson-----------	0-6	1-4	1.35-1.50	6.0-20	0.10-0.15	7.4-9.0	>16	Low--------	0.10	5	2	---
	6-25	1-4	1.50-1.65	2.0-20	0.05-0.10	7.4-9.0	>16	Low--------	0.10			
	25-45	1-4	1.55-1.70	2.0-20	0.05-0.15	7.4-9.0	>16	Low--------	0.10			
	45-80	2-8	1.45-1.65	2.0-20	0.05-0.15	7.4-9.0	>16	Low--------	0.10			
54----------------- Zolfo	0-7	1-5	1.40-1.50	>20	0.05-0.11	4.5-7.3	<2	Low--------	0.10	5	2	.5-1
	7-65	1-5	1.50-1.60	>20	0.03-0.10	4.5-7.3	<2	Low--------	0.10			
	65-80	1-5	1.30-1.40	0.6-2.0	0.10-0.15	3.6-6.5	<2	Low--------	0.20			
55----------------- Zolfo	0-3	1-5	1.40-1.50	>20	0.05-0.11	4.5-7.3	<2	Low--------	0.10	5	2	.5-1
	3-65	1-5	1.50-1.60	>20	0.03-0.10	4.5-7.3	<2	Low--------	0.10			
	65-80	1-5	1.30-1.40	0.6-2.0	0.10-0.15	3.6-6.5	<2	Low--------	0.20			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Depth	Hardness	Uncoated steel	Concrete
					Ft			In		In			
1------------------ Adamsville Variant	C	None---------	---	---	0.5-1.5	Apparent	Jun-Nov	>60	---	---	---	Low-------	High.
2. Beaches													
3------------------ Braden	B	Rare---------	---	---	2.5-3.5	Apparent	Jun-Oct	>60	---	---	---	Moderate	Moderate.
4------------------ Bradenton	D	None---------	---	---	0-1.0	Apparent	Jun-Dec	>60	---	---	---	High------	Low.
5------------------ Bradenton	B/D	None---------	---	---	0-1.0	Apparent	Jun-Dec	40-80	Soft	---	---	High------	Low.
6------------------ Broward Variant	B/D	None---------	---	---	0-1.0	Apparent	Jun-Oct	20-40	Soft	---	---	Moderate	High.
7: Canova*-----------	B/D	None---------	---	---	+2.-0	Apparent	Jan-Dec	>60	---	---	---	High------	Low.
Anclote-----------	D	None---------	---	---	0-1.0	Apparent	Jun-Dec	>60	---	---	---	Moderate	Moderate.
Okeelanta*--------	A/D	None---------	---	---	+1-0	Apparent	Jun-Jan	>60	---	---	---	High------	Moderate.
8, 9--------------- Canaveral	C	None---------	---	---	1.0-3.0	Apparent	Jun-Nov	>60	---	---	---	Moderate	Low.
10----------------- Canaveral	C	None---------	---	---	2.5-5.0	Apparent	Jan-Dec	>60	---	---	---	Moderate	Low.
11----------------- Cassia	C	None---------	---	---	1.5-3.5	Apparent	Jul-Jan	>60	---	---	---	Moderate	High.
12----------------- Cassia	B	None---------	---	---	3.5-5.0	Apparent	Jul-Jan	>60	---	---	---	Moderate	High.
13----------------- Chobee	B/D	None---------	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	Moderate	Low.
14*---------------- Chobee Variant	D	None---------	---	---	+2-1.0	Apparent	Jul-Dec	>60	---	---	---	High------	Low.
15, 16------------- Delray	B/D	None---------	---	---	0-1.0	Apparent	Jun-Mar	>60	---	---	---	Moderate	Low.
17: Delray------------	B/D	None---------	---	---	0-1.0	Apparent	Jun-Mar	>60	---	---	---	Moderate	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Cemented pan: Depth	Cemented pan: Hardness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
17:													
EauGallie	B/D	None	---	---	0-1.0	Apparent	Jun-Oct	>60	---	---	---	High	Moderate.
18:													
Delray	B/D	None	---	---	0-1.0	Apparent	Jun-Mar	>60	---	---	---	Moderate	Low.
Pomona	B/D	None	---	---	0-1.0	Apparent	Jul-Sep	>60	---	---	---	High	High.
19 Duette	A	None	---	---	4.0-6.0	Apparent	Jun-Oct	>60	---	---	---	Low	High.
20 EauGallie	B/D	None	---	---	0-1.0	Apparent	Jun-Oct	>60	---	---	---	High	Moderate.
21 Estero	D	Frequent	Very long	Jan-Dec	0-1.0	Apparent	Jan-Dec	>60	---	---	---	High	High.
22 Felda	B/D	None	---	---	0-1.0	Apparent	Jul-Mar	>60	---	---	---	High	Moderate.
23:													
Felda	B/D	None	---	---	0-1.0	Apparent	Jul-Mar	>60	---	---	---	High	Moderate.
Palmetto	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High	High.
24:													
Felda	B/D	Frequent	Brief	Jul-Feb	0-1.0	Apparent	Jul-Mar	>60	---	---	---	High	Moderate.
Wabasso	B/D	Frequent	Brief to	Jun-Nov	0-1.0	Apparent	Jun-Nov	>60	---	---	---	Moderate	High.
25 Floridana	B/D	None	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	Moderate	Low.
26:*													
Floridana	B/D	None	---	---	+2-1.0	Apparent	Jun-Feb	>60	---	---	---	Moderate	Low.
Immokalee	D	None	---	---	+2-1.0	Apparent	Jun-Feb	>60	---	---	---	High	High.
Okeelanta	A/D	None	---	---	+1-0	Apparent	Jun-Jan	>60	---	---	---	High	Moderate.
27* Gator	D	Frequent	Very long	Jun-Apr	+1-0	Apparent	Jun-Mar	>60	---	---	---	High	High.
28 Hallandale	A/D	None	---	---	0-1.0	Apparent	Jun-Nov	<20	Soft	---	---	High	Low.
29 Manatee	D	None	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	High	Low.
30, 31 Myakka	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High	High.
32 Myakka	B/D	None	---	---	0-1.0	Apparent	Jun-Oct	>60	---	---	---	High	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Cemented pan: Depth	Cemented pan: Hardness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
33----------------- Myakka	D	Frequent----	---	Jan-Dec	0-1.0	Apparent	Jan-Dec	>60	---	---	---	High-----	Low.
34----------------- Okeelanta	D	Frequent----	---	Jan-Dec	0-1.0	Apparent	Jan-Dec	>60	---	---	---	High-----	Low.
35----------------- Ona	B/D	None---------	---	---	0-1.0	Perched	Jun-Nov	>60	---	40-60	Thin	High-----	High.
36----------------- Orlando	A	None---------	---	---	3.5-6.0	Apparent	Jun-Dec	>60	---	---	---	Low------	High.
37----------------- Orsino	A	None---------	---	---	3.5-5.0	Apparent	Jun-Dec	>60	---	---	---	Low------	Moderate.
38----------------- Palmetto	B/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	High.
39----------------- Parkwood Variant	B/D	None---------	---	---	0-1.0	Apparent	Jun-Oct	30-60	Soft	---	---	High-----	Low.
40----------------- Pinellas	B/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	Low.
41. Pits and Dumps													
42----------------- Pomello	C	None---------	---	---	2.0-3.5	Apparent	Jul-Nov	>60	---	---	---	Low------	High.
43----------------- St. Johns	B/D	None---------	---	---	0-1.0	Apparent	Jun-Apr	>60	---	---	---	High-----	High.
44:													
St. Johns---------	B/D	None---------	---	---	0-1.0	Apparent	Jun-Apr	>60	---	---	---	High-----	High.
Myakka------------	B/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	High.
45----------------- Tavares	A	None---------	---	---	3.5-6.0	Apparent	Jun-Dec	>60	---	---	---	Low------	High.
46----------------- Tavares	A	None---------	---	---	3.5-6.0	Apparent	Jun-Dec	>60	---	40-80	Thin	Low------	High.
47*---------------- Tomoka	A/D	None---------	---	---	+1-0	Apparent	Jun-Apr	>60	---	---	---	High-----	High.
48----------------- Wabasso	B/D	None---------	---	---	0-1.0	Apparent	Jun-Oct	>60	---	---	---	Moderate	High.
49----------------- Wabasso	B/D	Rare---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	Moderate	High.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Depth	Hardness	Uncoated steel	Concrete
					Ft			In		In			
50----------------- Wabasso Variant	B/D	None---------	---	---	0-1.0	Apparent	Jun-Oct	30-40	Soft	---	---	Moderate	High.
51----------------- Wauchula	B/D	None---------	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	High------	High.
52----------------- Waveland	B/D	None---------	---	---	0-1.0	Perched	Jun-Oct	>60	---	30-50	Thin	High------	High.
53:													
Wulfert-----------	D	Frequent----	Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	>60	---	---	---	High------	High.
Kesson------------	D	Frequent----	Very long	---	0-0.5	Apparent	Jan-Dec	>60	---	---	---	High------	Low.
54, 55------------- Zolfo	C	None---------	---	---	2.0-3.5	Apparent	Jun-Nov	>60	---	---	---	Low-------	Moderate.

* In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

TABLE 16.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Adamsville Variant	Siliceous, hyperthermic Humaqueptic Psammaquents
Anclote	Sandy, siliceous, hyperthermic Typic Haplaquolls
Braden	Loamy, siliceous, hyperthermic Arenic Hapludults
Bradenton	Coarse-loamy, siliceous, hyperthermic Typic Ochraqualfs
Broward Variant	Sandy, siliceous, hyperthermic Entic Haplaquods
Canaveral	Hyperthermic, uncoated Aquic Quartzipsamments
Canova	Fine-loamy, siliceous, hyperthermic Typic Glossaqualfs
Cassia	Sandy, siliceous, hyperthermic Typic Haplohumods
Chobee	Fine-loamy, siliceous, hyperthermic Typic Argiaquolls
Chobee Variant	Fine-loamy, carbonatic, hyperthermic Typic Haplaquolls
Delray	Loamy, mixed, hyperthermic Grossarenic Argiaquolls
Duette	Sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods
EauGallie	Sandy, siliceous, hyperthermic Alfic Haplaquods
Estero	Sandy, siliceous, hyperthermic Typic Haplaquods
Felda	Loamy, siliceous, hyperthermic Arenic Ochraqualfs
Floridana	Loamy, siliceous, hyperthermic Arenic Argiaquolls
Gator	Loamy, siliceous, euic, hyperthermic Terric Medisaprists
Hallandale	Siliceous, hyperthermic Typic Psammaquents
Immokalee	Sandy, siliceous, hyperthermic Arenic Haplaquods
Kesson	Siliceous, hyperthermic Typic Psammaquents
Manatee	Coarse-loamy, siliceous, hyperthermic Typic Argiaquolls
Myakka	Sandy, siliceous, hyperthermic Aeric Haplaquods
Okeelanta	Sandy or sandy-skeletal, siliceous, euic, hyperthermic Terric Medisaprists
Ona	Sandy, siliceous, hyperthermic Typic Haplaquods
Orlando	Sandy, siliceous, hyperthermic Quartzipsammentic Haplumbrepts
Orsino	Hyperthermic, uncoated Spodic Quartzipsamments
Palmetto	Loamy, siliceous, hyperthermic Grossarenic Paleaquults
Parkwood Variant	Coarse-loamy, siliceous, hyperthermic Mollic Ochraqualfs
Pinellas	Loamy, siliceous, hyperthermic Arenic Ochraqualfs
Pomello	Sandy, siliceous, hyperthermic Arenic Haplohumods
Pomona	Sandy, siliceous, hyperthermic Ultic Haplaquods
St. Johns	Sandy, siliceous, hyperthermic Typic Haplaquods
Tavares	Hyperthermic, uncoated Typic Quartzipsamments
Tomoka	Loamy, siliceous, dysic, hyperthermic Terric Medisaprists
Wabasso	Sandy, siliceous, hyperthermic Alfic Haplaquods
Wabasso Variant	Sandy, siliceous, hyperthermic Alfic Haplaquods
Wauchula	Sandy, siliceous, hyperthermic Ultic Haplaquods
Waveland	Sandy, siliceous, hyperthermic, ortstein Arenic Haplaquods
Wulfert	Sandy or sandy-skeletal, siliceous, euic, hyperthermic Terric Sulfihemists
Zolfo	Sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods

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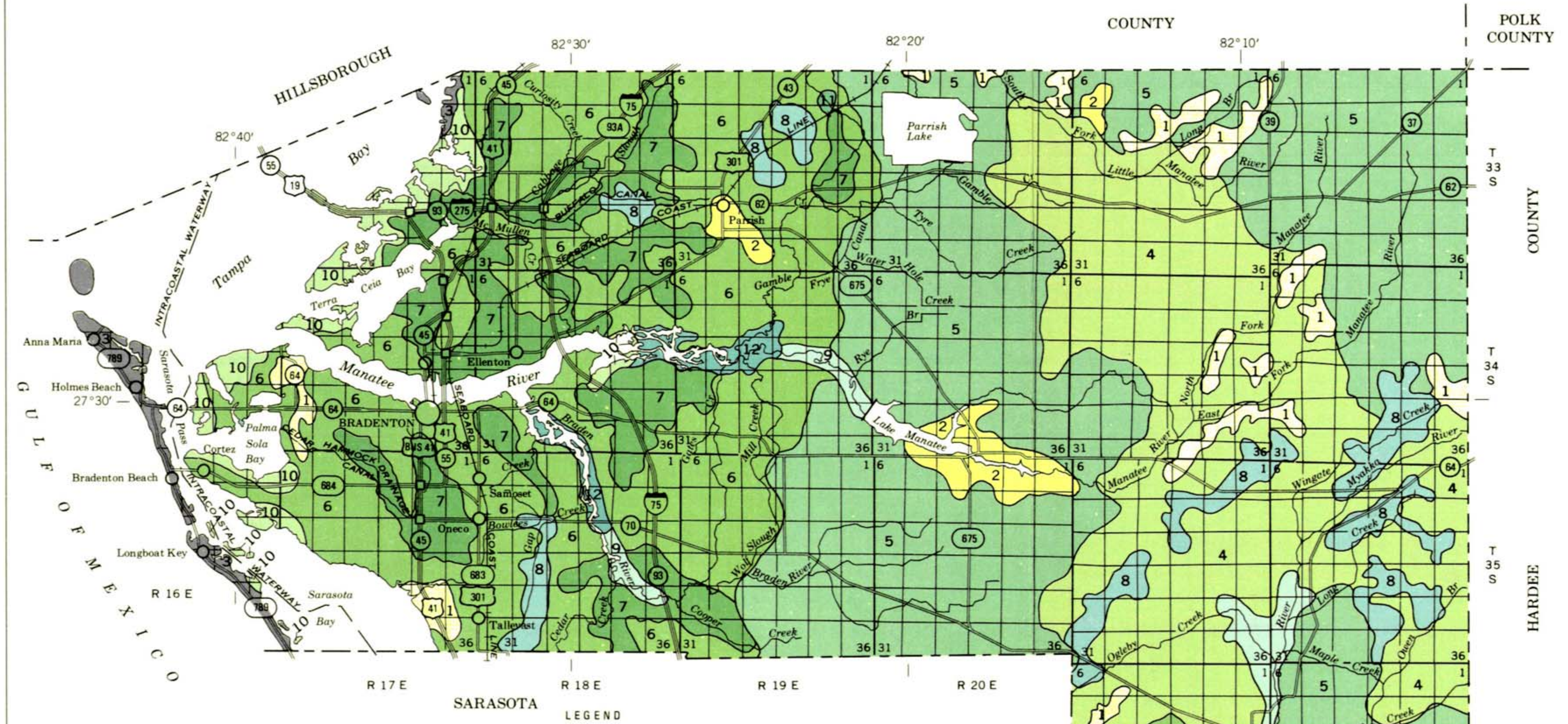


LEGEND

SOILS OF THE SANDY RIDGES AND KNOLLS

1 — Pomello-Cassia-Duette: Nearly level to gently sloping, moderately well drained and somewhat poorly drained sandy soils that have a dark colored subsoil

2 — Tavares-Cassia-Zolfo: Nearly level to gently sloping sandy soils; some are moderately well drained and do not have a subsoil, and others are moderately well drained and somewhat poorly drained and have a dark colored subsoil

SOILS OF THE COASTAL ISLANDS

3 — Canaveral-Beaches-Myakka: Nearly level to gently sloping, moderately well drained to poorly drained sandy soils that have shell fragments; some have a dark colored subsoil

SOILS OF THE FLATWOODS

4 — Waveland-Pomello-Myakka: Nearly level sandy soils that have a dark colored subsoil; most are poorly drained and are weakly cemented in the subsoil, and others are moderately well drained and are not cemented in the subsoil

5 — Myakka-Waveland-Cassia: Nearly level sandy soils that have a dark colored subsoil; most are poorly drained and are not cemented in the subsoil, some are poorly drained and are weakly cemented in the subsoil, and some are somewhat poorly drained and moderately well drained and are not cemented in the subsoil

6 — EauGallie-Floridana: Nearly level sandy soils; most are poorly drained and have a subsoil that is dark colored and sandy in the upper part and loamy in the lower part, and some are very poorly drained and have a loamy subsoil

7 — Wabasso-Bradenton-EauGallie: Nearly level, poorly drained sandy soils; most have a subsoil that is dark colored and sandy in the upper part and loamy in the lower part, and some have a loamy subsoil and are underlain by limestone

SOILS OF THE WET DEPRESSIONS, FLOOD PLAINS, SWAMPS, AND MARSHES

8 — Delray-Floridana: Nearly level, very poorly drained sandy soils mainly in depressions; they have a loamy subsoil

9 — Felda-Wabasso: Nearly level, poorly drained sandy soils on flood plains; some have a loamy subsoil, and others have a subsoil that is dark colored and sandy in the upper part and loamy in the lower part

10 — Estero-Wulfert-Kesson: Nearly level, very poorly drained sandy and organic soils in tidal mangrove swamps

11 — Tomoka: Nearly level, very poorly drained organic soils in freshwater marshes

12 — Okeelanta: Nearly level, very poorly drained organic soils on flood plains

Compiled 1981

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

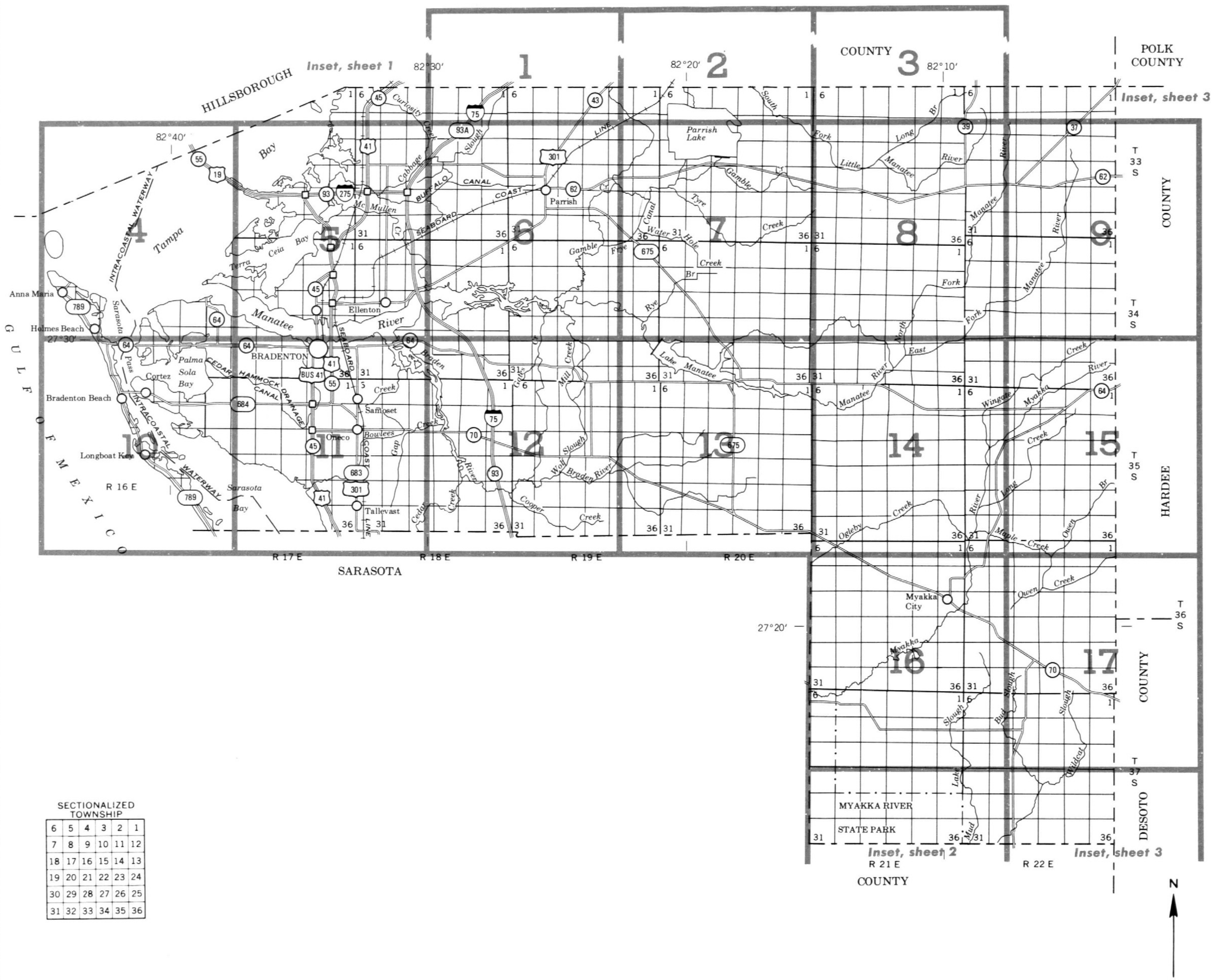
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF FLORIDA
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES
AGRICULTURAL EXPERIMENT STATIONS
SOIL SCIENCE DEPARTMENT
FLORIDA DEPARTMENT OF AGRICULTURAL AND CONSUMER SERVICES

GENERAL SOIL MAP
MANATEE COUNTY, FLORIDA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km



INDEX TO MAP SHEETS

MANATEE COUNTY, FLORIDA

Scale 1:253,440

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MANATEE COUNTY, FLORIDA

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SOIL LEGEND

The legend is numeric. Soil names followed by the superscript 1/ are broadly defined units. The composition of these units is more variable than that of the other units in the survey area, but has been controlled well enough to be interpreted for the expected use of the soils. Soils without a slope designation in the name are those that occur only on nearly level landscapes or miscellaneous areas.

SYMBOL	NAME
1	Adamsville Variant fine sand
2	Beaches 1/
3	Braden fine sand
4	Bradenton fine sand
5	Bradenton fine sand, limestone substratum
6	Broward Variant fine sand
7	Canova, Anclote, and Okeelanta soils 1/
8	Canaveral fine sand, 0 to 5 percent slopes
9	Canaveral sand, filled
10	Canaveral sand, organic substratum
11	Cassia fine sand
12	Cassia fine sand, moderately well drained
13	Chobee loamy fine sand
14	Chobee Variant sandy clay loam
15	Delray mucky loamy fine sand
16	Delray complex
17	Delray-EauGallie complex
18	Delray-Pomona complex
19	Duette fine sand, 0 to 5 percent slopes
20	EauGallie fine sand
21	Estero muck
22	Felda fine sand
23	Felda-Palmetto complex
24	Felda-Wabasso association, frequently flooded 1/
25	Floridana fine sand
26	Floridana-Immokalee-Okeelanta association 1/
27	Gator muck
28	Hallandale fine sand
29	Manatee mucky loamy fine sand
30	Myakka fine sand, 0 to 2 percent slopes
31	Myakka fine sand, 2 to 5 percent slopes
32	Myakka fine sand, shell substratum
33	Myakka fine sand, tidal
34	Okeelanta muck, tidal
35	Ona fine sand, ortstein substratum
36	Orlando fine sand, moderately wet, 0 to 2 percent slopes
37	Orsino fine sand, 0 to 5 percent slopes
38	Palmetto sand
39	Parkwood Variant complex
40	Pinellas fine sand
41	Pits and dumps 1/
42	Pomello fine sand, 0 to 2 percent slopes
43	St. Johns fine sand, 2 to 5 percent slopes
44	St. Johns-Myakka complex
45	Tavares fine sand, 0 to 5 percent slopes
46	Tavares fine sand, cemented substratum, 2 to 5 percent slopes
47	Tomoka muck
48	Wabasso fine sand
49	Wabasso fine sand, rarely flooded
50	Wabasso Variant fine sand
51	Wauchula fine sand
52	Waveland fine sand
53	Wulfert-Kesson association 1/
54	Zolfo fine sand, 0 to 2 percent slopes
55	Zolfo fine sand, 2 to 5 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water

PITS — w

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Shell or Indian Mound (label) — Shell or Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 20, 48

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

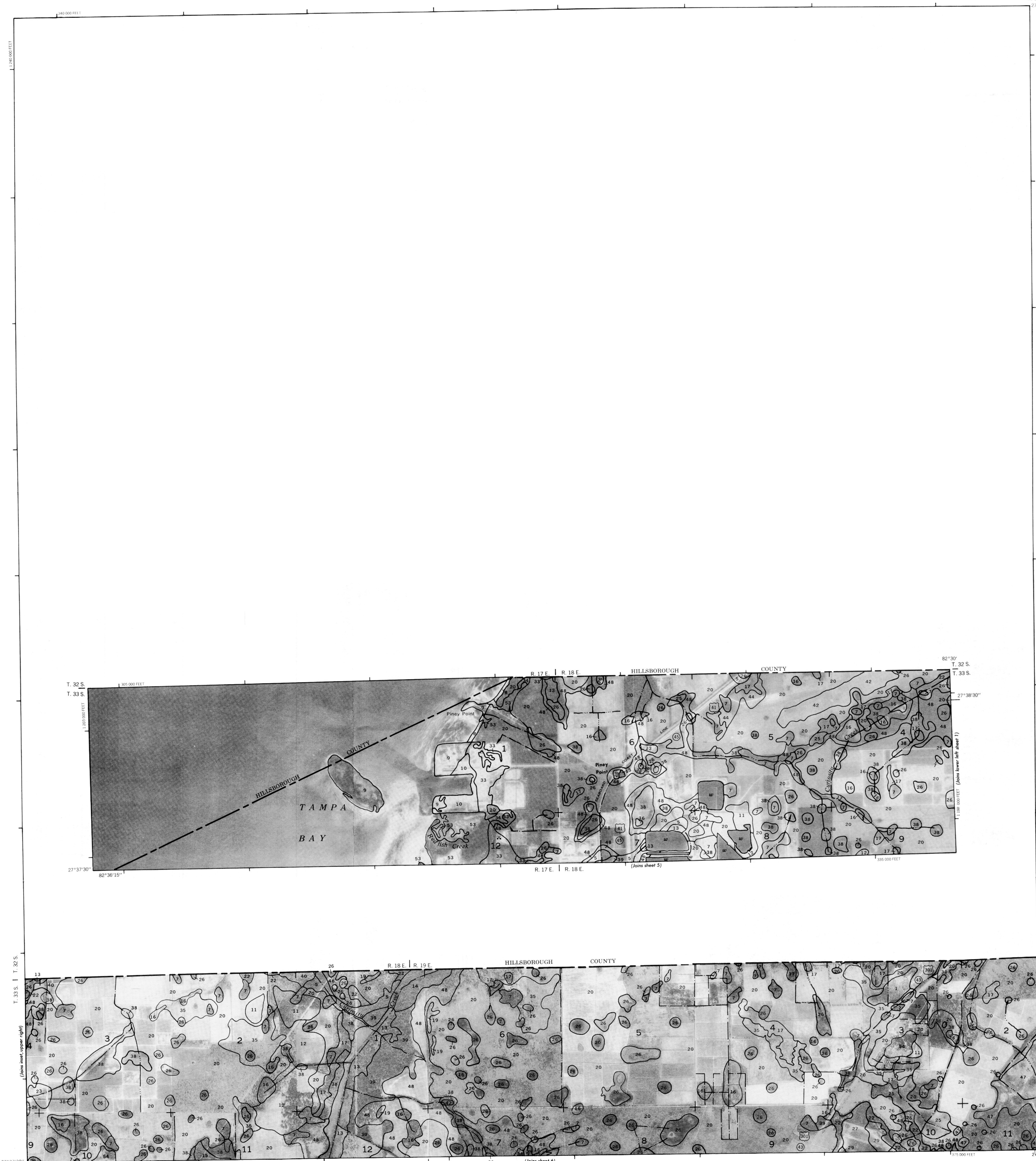
GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot



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Scale - 1:24000

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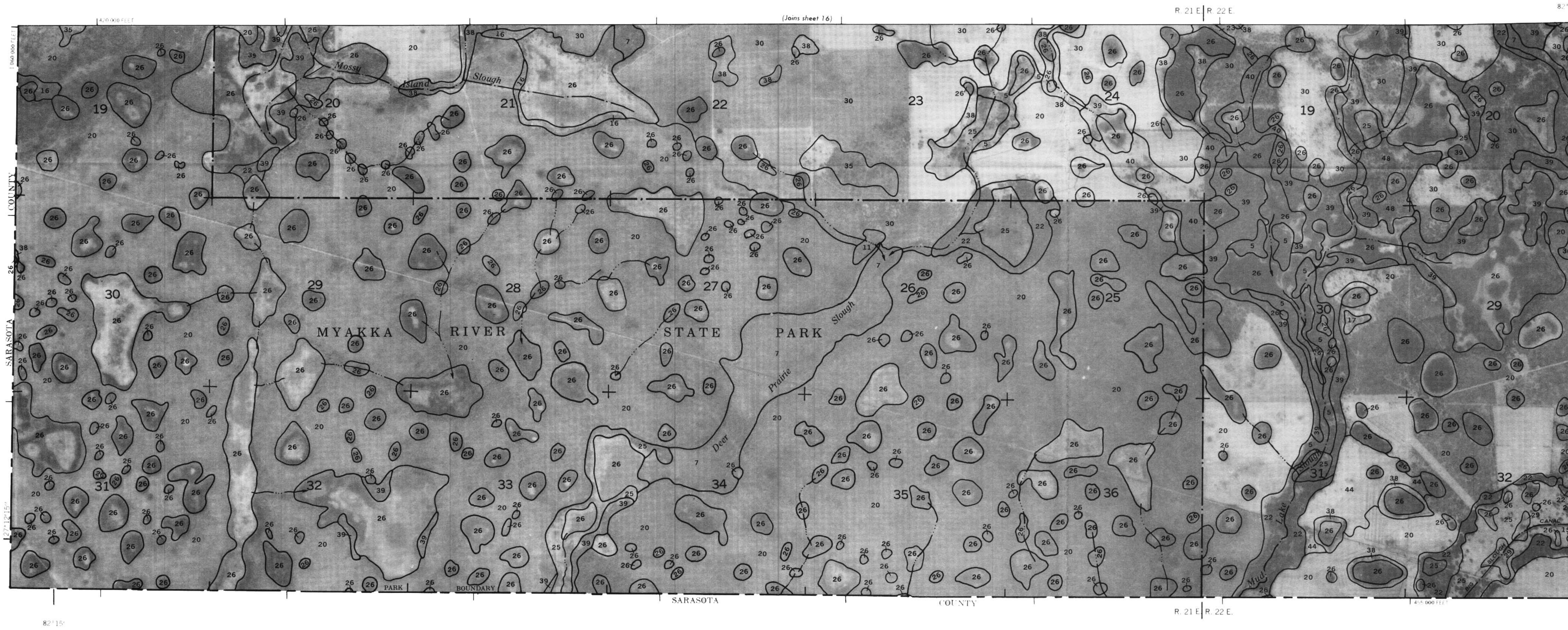
This map was compiled by U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies on 1979 photography obtained from U.S. Department of Interior, Geological Survey.



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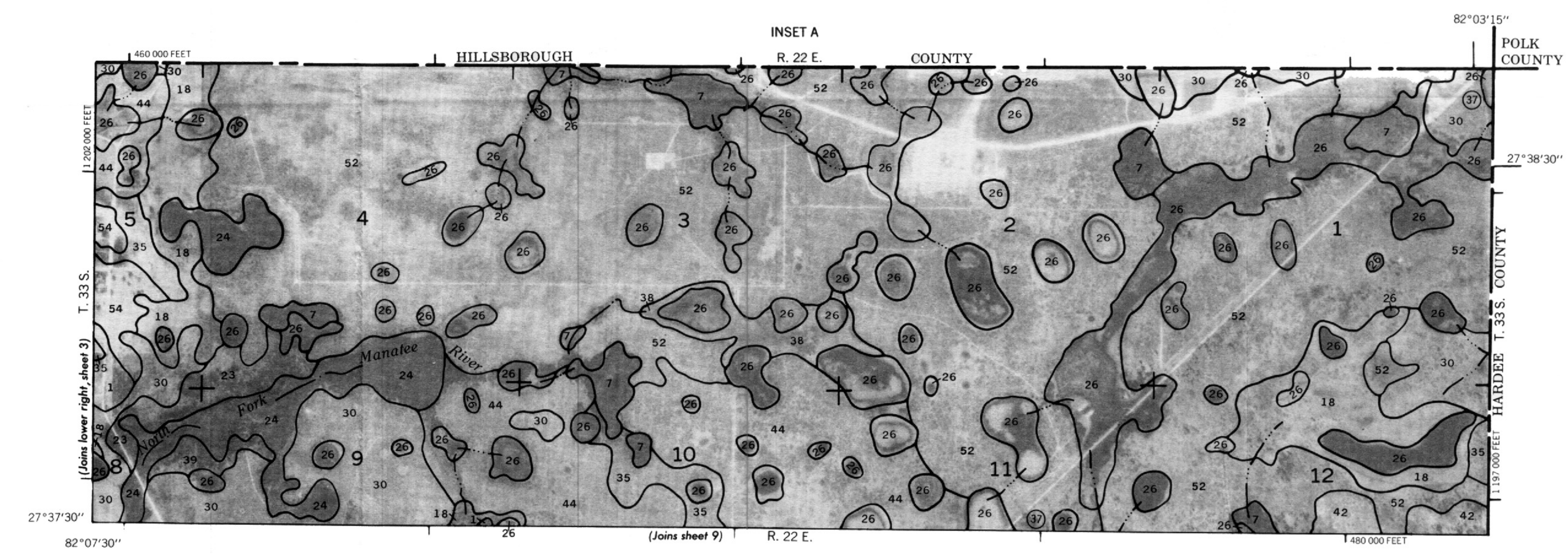

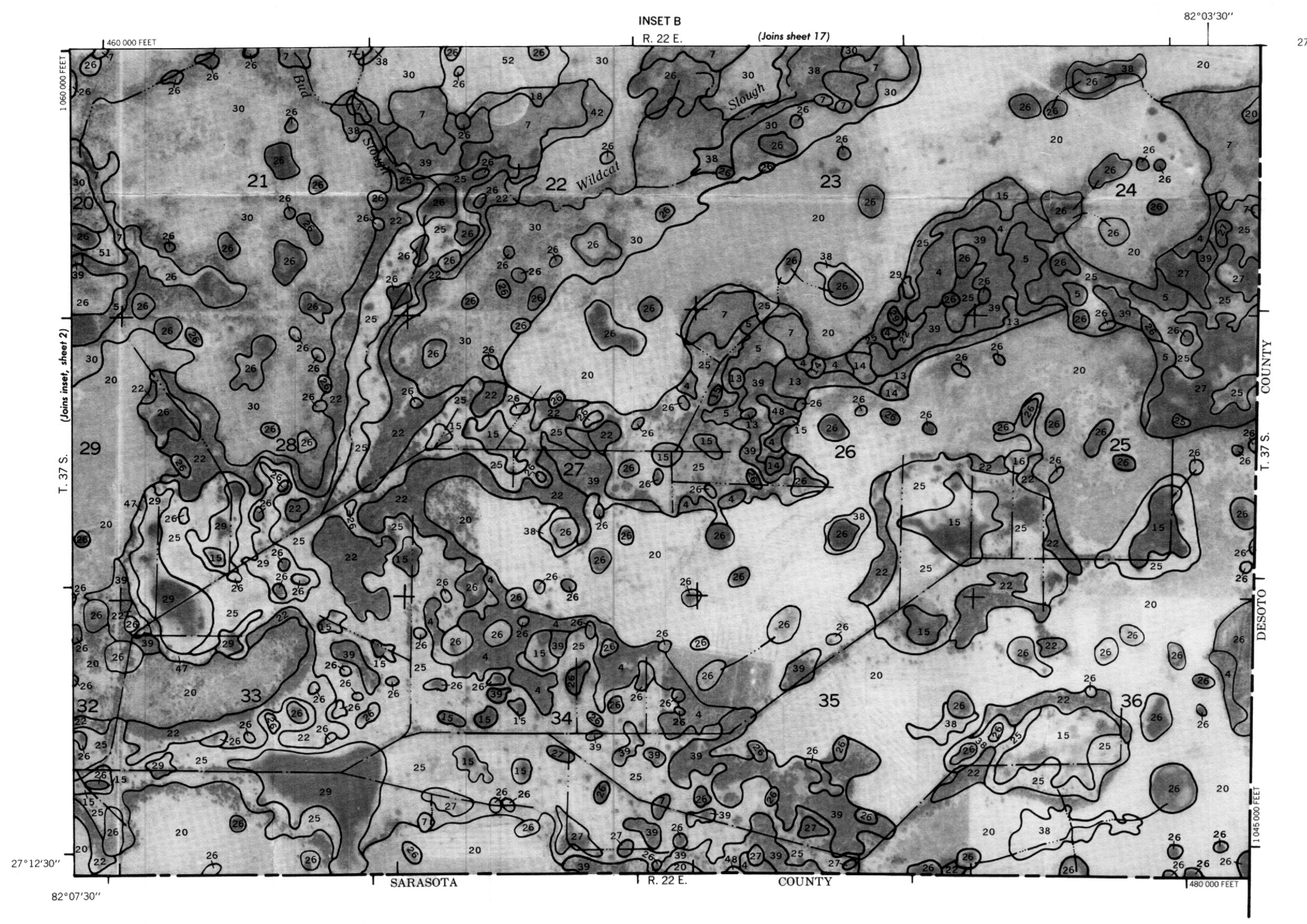

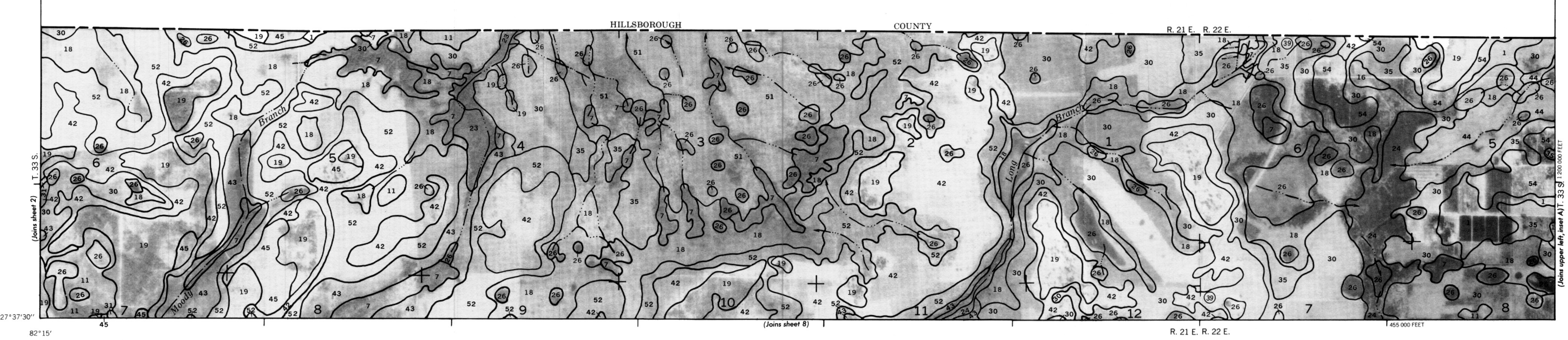

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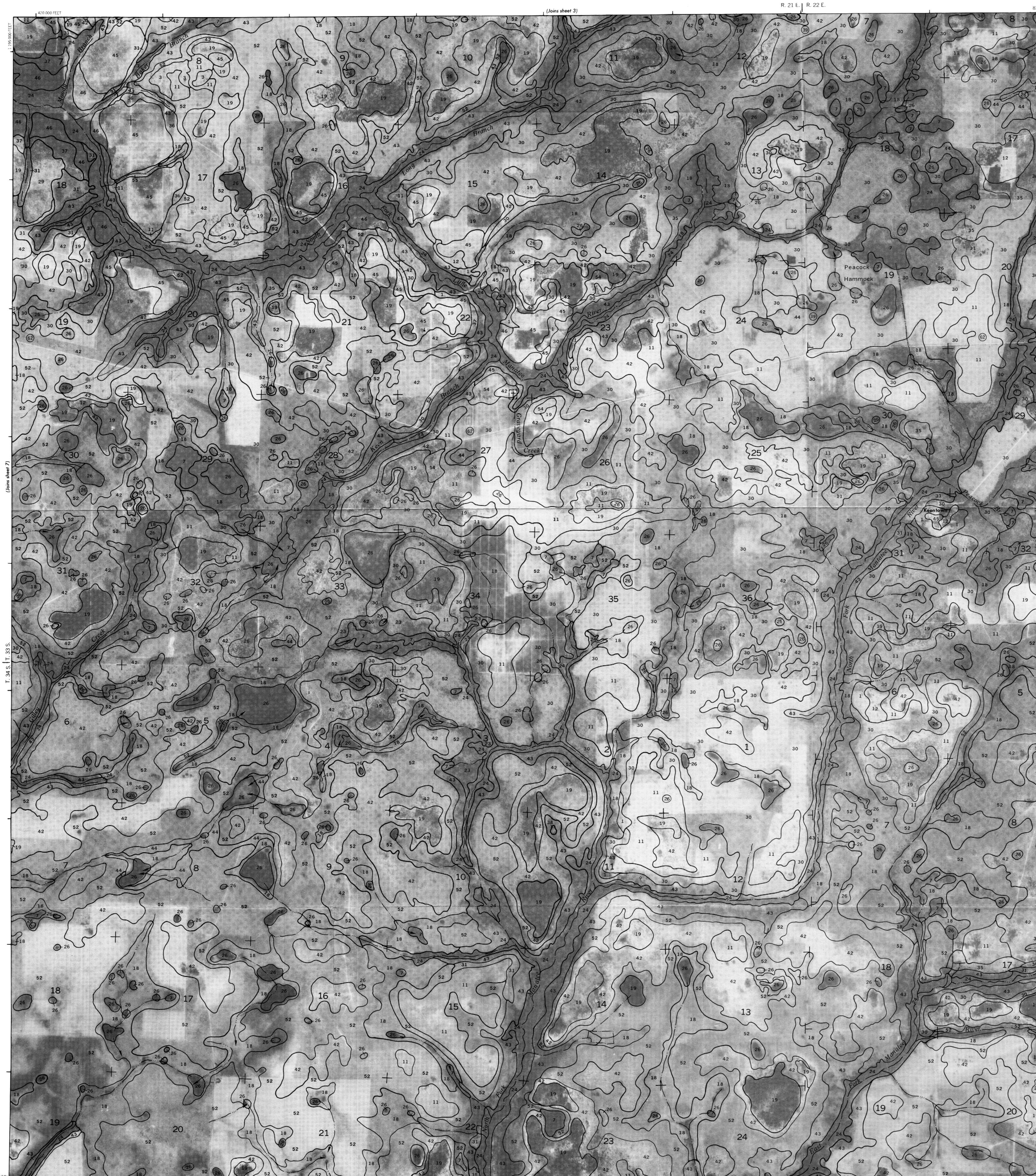

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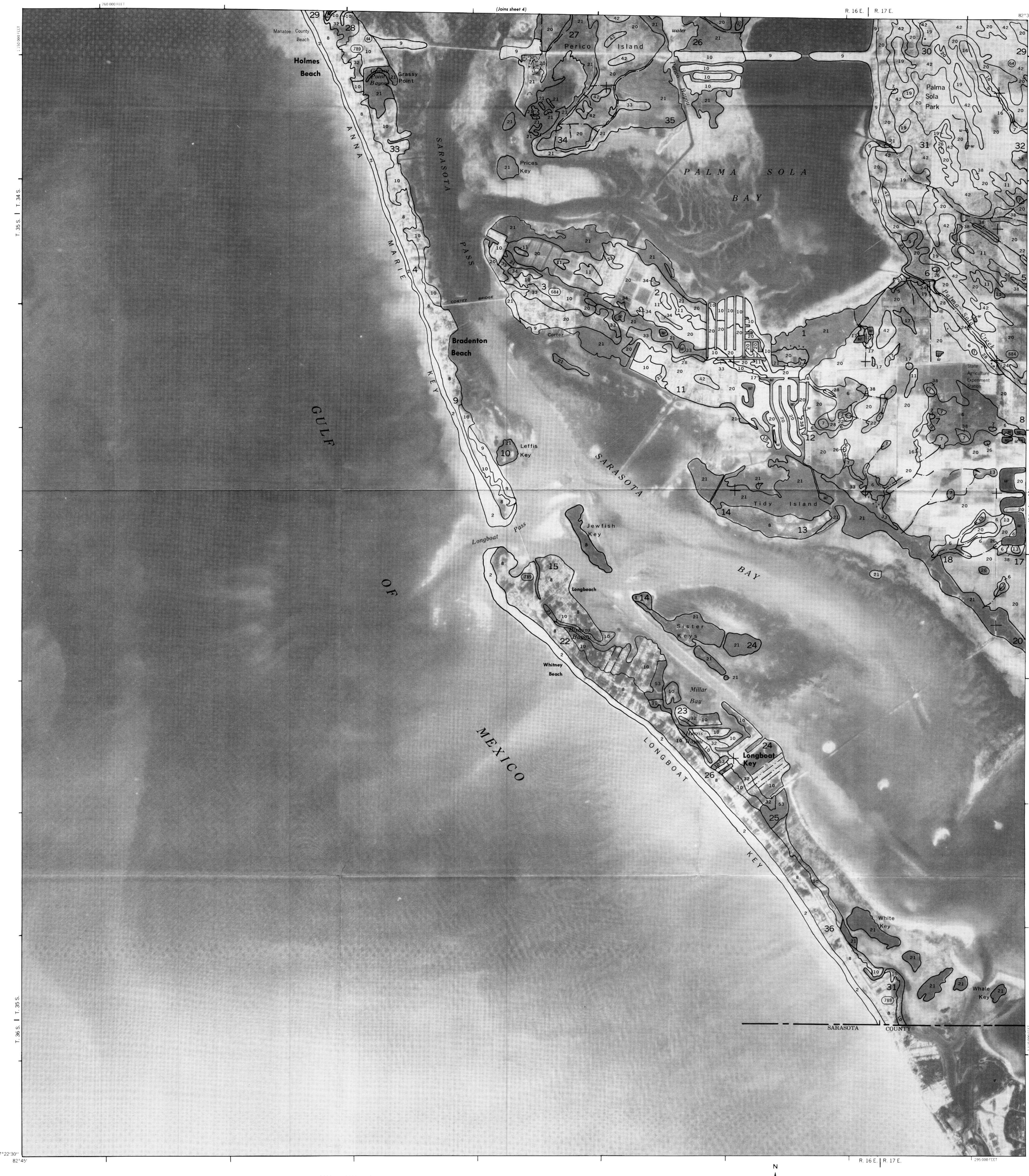
SOIL CONSERVATION SERVICE

SHEET NUMBER 10
MANATEE COUNTY, FLORIDA



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MANATEE COUNTY, FLORIDA NO. 10

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NUMBER 13
MANATEE COUNTY, FLORIDA

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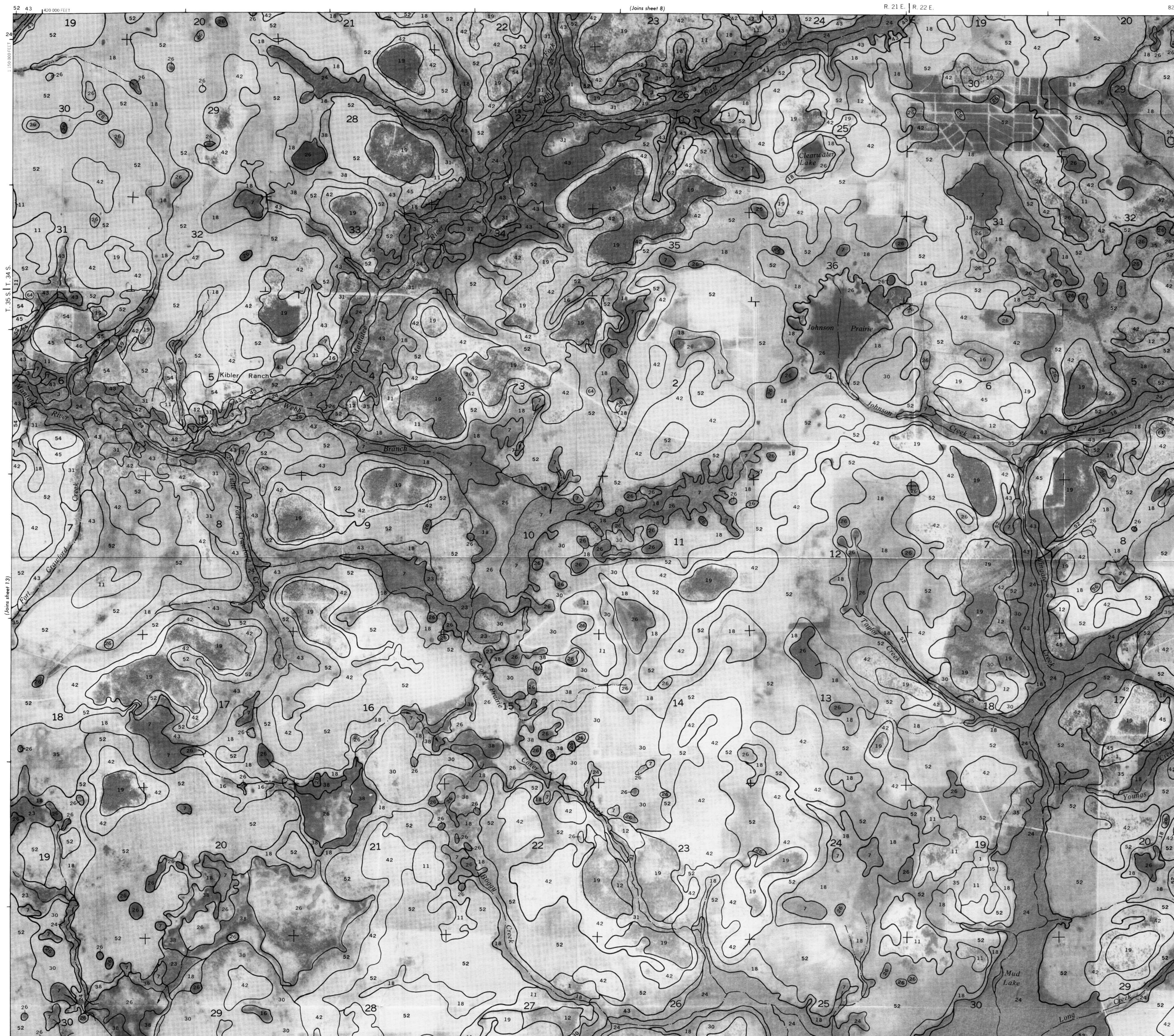
SOIL CONSERVATION SERVICE

SHEET NUMBER 14
MANATEE COUNTY, FLORIDA



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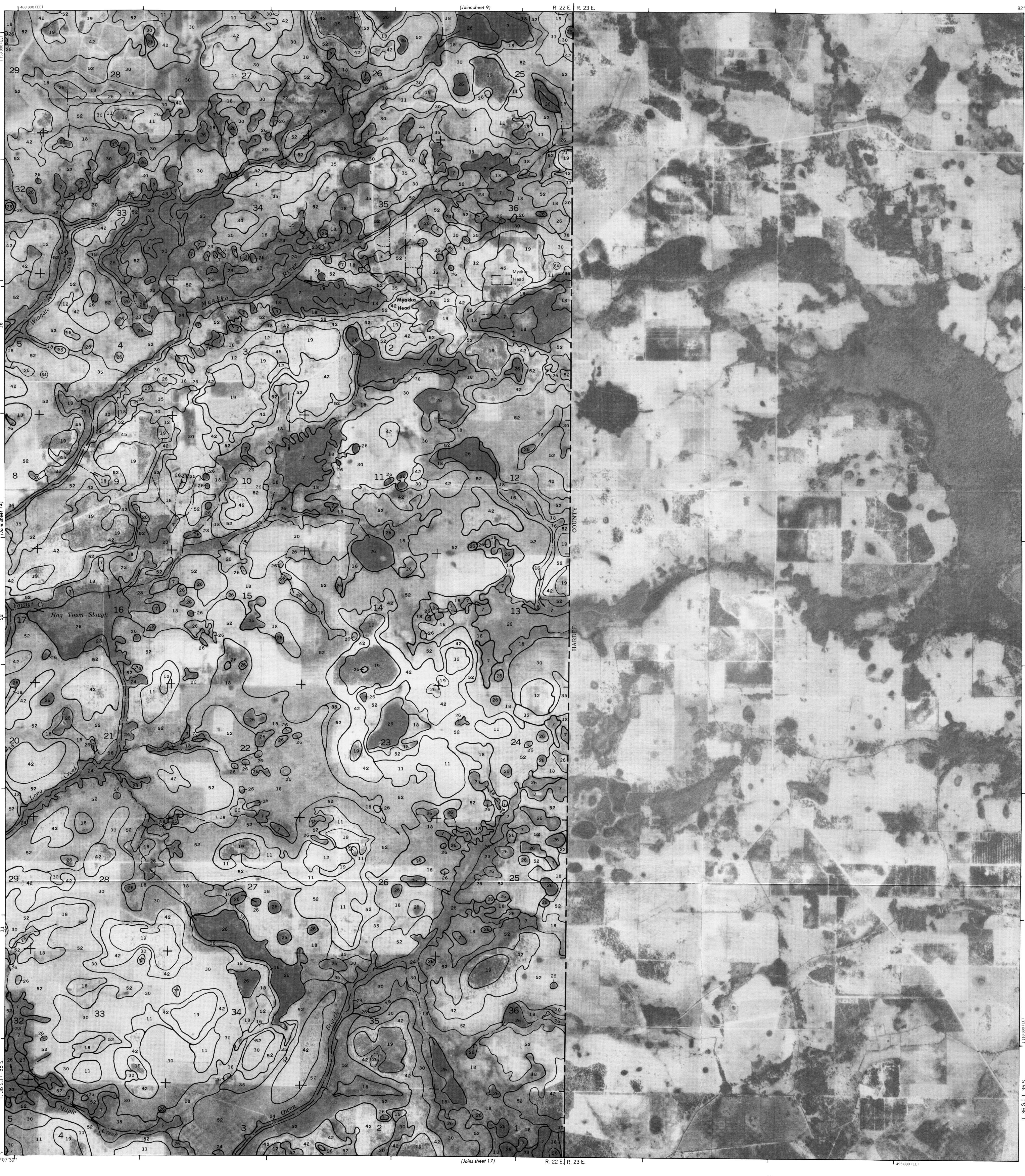
MANATEE COUNTY, FLORIDA NO. 14



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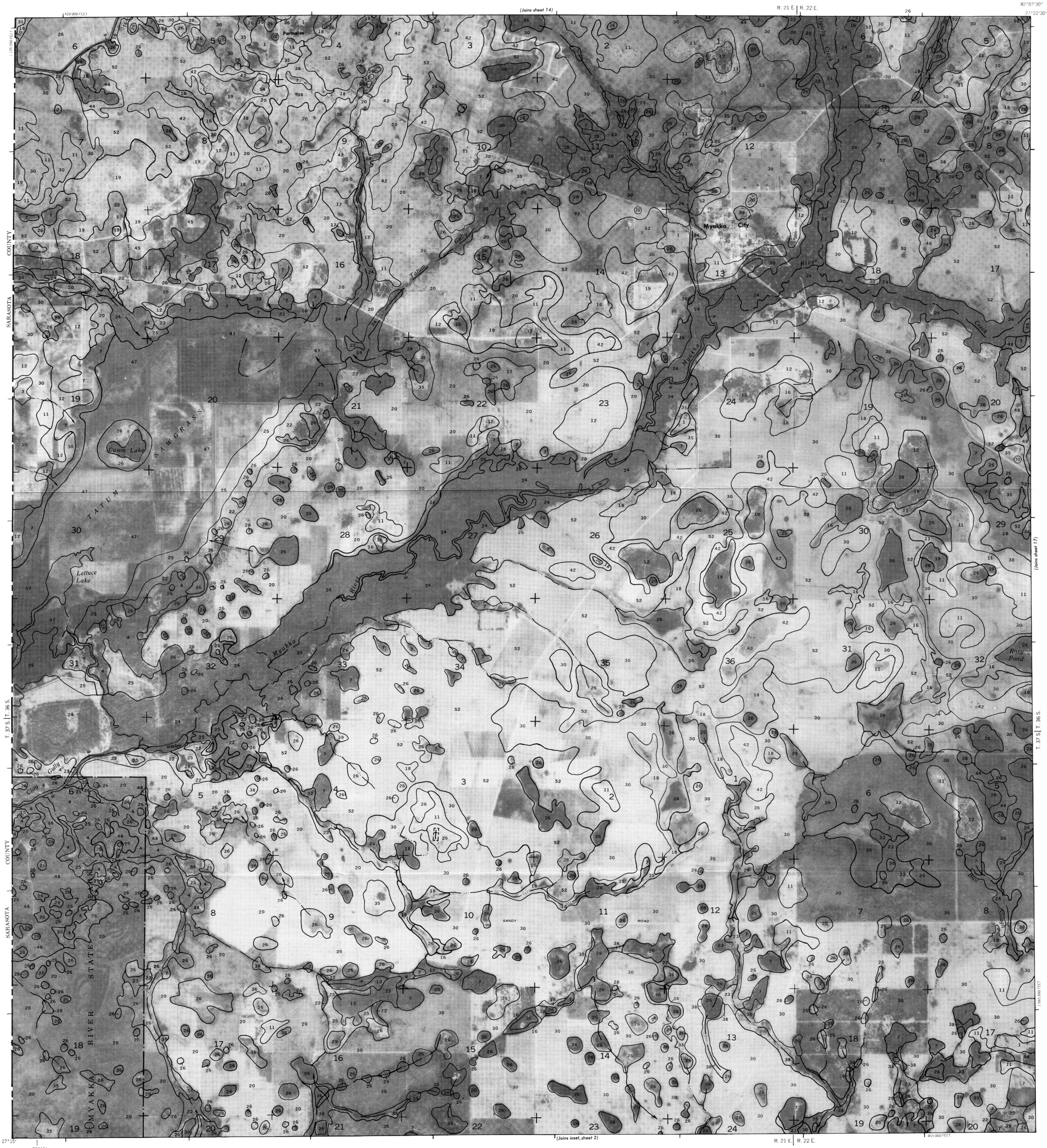

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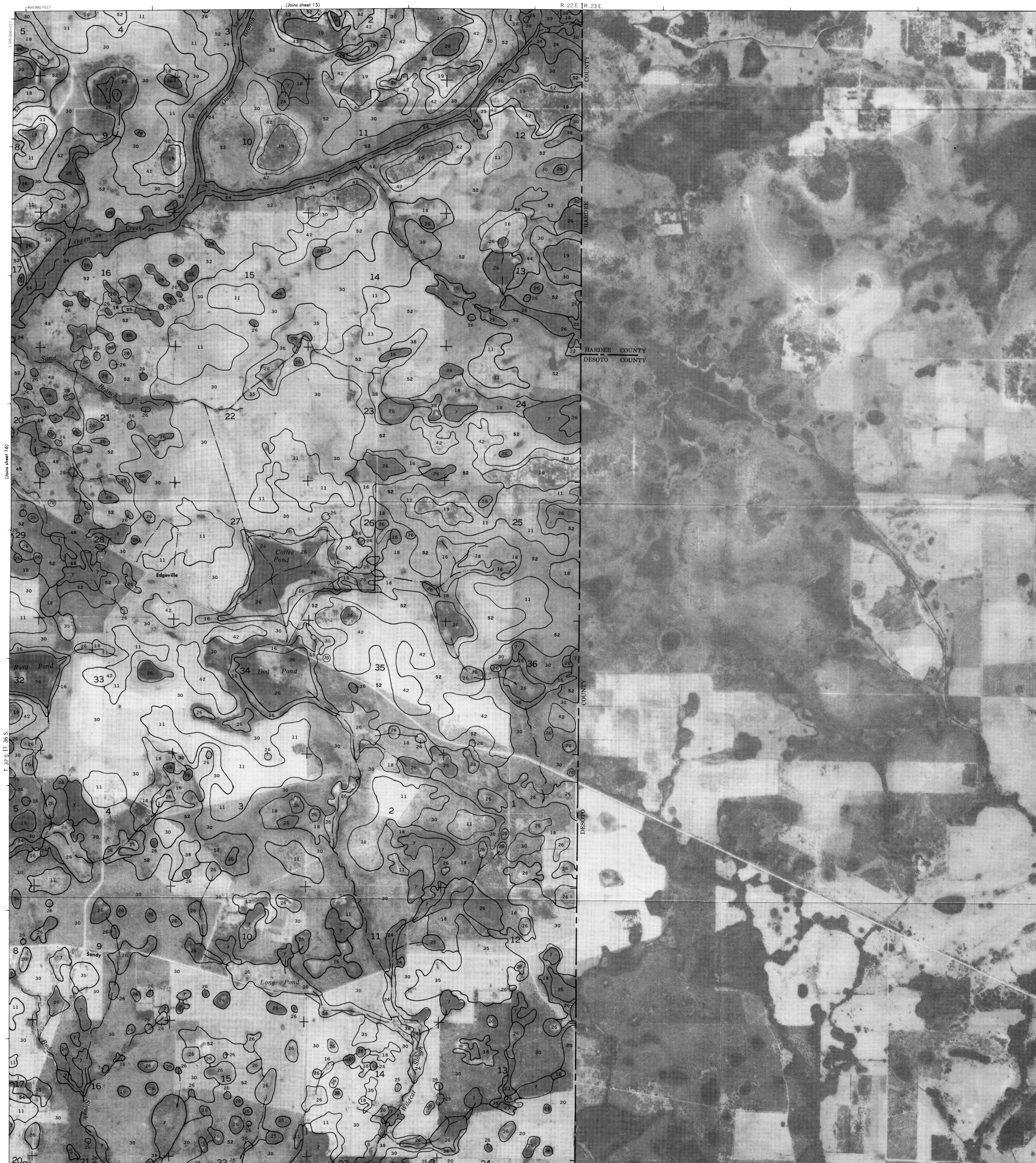

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